# Journal

of the

# Royal Naval Medical Service.

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AND

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[illegible] Memorial Erected at the Royal Naval Hospital [illegible]

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# Journal of the Royal Naval Medical Service.

## NAVAL MEDICAL WAR MEMORIALS

### UNVEILING CEREMONIES AT CHATHAM AND PLYMOUTH

### CHATHAM

THE last of the three unveiling ceremonies in connection with the Naval Medical War Memorials took place at Chatham on Armistice Day, Saturday November 11 1922 when Surgeon Vice Admiral Sir Robert Hill, K.C.B., K.C.M.G., C.V.O. Medical Director General of the Navy unveiled the Memorial that has been erected at the Royal Naval Hospital

The Ceremony took place in the presence of a large and distinguished gathering of naval and military officers and their wives and of the general public The guests included the Commander in Chief and Lady Evan Thomas, the Venerable Archdeacon of Rochester and Mrs Tait Rear Admiral and Mrs F. B. Riddle Colonel Commandant and Mrs A. R. P. Hutchison Engineer Rear Admiral and Mrs Finlin Commodore A. V. Campbell, the Matron in Chief of the Army Medical Nursing Service the Mayor and Mayoress of Rochester, the Mayor and Mayoress of Gillingham, Sir William Hale White, Sir George Lenthal Cheatle Sir George Turner, Mr Arthur Edmunds the Dean of Charing Cross Hospital Medical School, the Dean of Middlesex Hospital Medical School Dr Robert Hutchison, Members of the Voluntary Aid Detachment and St John Ambulance Brigade, and many others including relatives and friends of the fallen

A bluejacket guard of honour under Lieutenant H. I. Caley R.N., was present with the band of the Royal Marine Light Infantry and five buglers in full ceremonial dress

The Memorial has been affixed to the outer wall of the porch in front of the entrance to the Hospital Receiving Room and the configuration of the grounds at this site lent itself admirably to the effective staging of what was a picturesque and impressive ceremony

[illegible] of the Memorial stood the [illegible] Hospital, the [illegible] B A with a surplice [illegible] At right [illegible] grouped the Medical Officers [illegible] large [illegible] gathering of the Medical [illegible] Next to these were the Nursing Sisters of the Hospital [illegible] group of Members of the Kent Voluntary Aid Detachment. Behind the Medical Officers and Nursing Sisters stood the Sick Berth Staff and representatives of the St John Ambulance Brigade

The ground in front was drawn up facing the Memorial with the band and buglers of the Royal Marine Light Infantry to their right and on the parade ground behind there was a large assembly of ladies and their guests. The Commander in Chief and Lady Irwin Thomas with other distinguished guests occupied the space to the left of the Memorial

The ceremony commenced at 3 30 p m when Surgeon Rear Admiral H A Draper C B briefly introduced Sir Robert Hill

Addressing the assembly Sir Robert said —

I have the honour to unveil this afternoon our Memorial to the Naval Medical Officers and Nursing Sisters who gave their lives in the Great War Our minds to day go back to the early days of the war when the medical profession offered themselves wholeheartedly to the Services unmindful of practices jeopardized and appointments [illegible] To no class of men did the war cause a greater upheaval of their private lives The action of the medical students was characteristic [illegible] the more subscriptions advanced in their studies joined up as surgeon [illegible] and served in Destroyers, sharing in the discomforts and [illegible] that such services entailed The younger students joined [illegible] units as fighting units Sisters and nurses came from their civil employment, with equal impetuous zeal and joined our Service in the Queen Alexandra's Imperial Naval Nursing Reserve The organizers of the Voluntary Aid Detachment deserve full credit—they were among the very [illegible] who prepared during peace for war and their members at the outbreak of hostilities fell into their places in the Army and Navy Alas! we [illegible] some of their names on our tablet to day The personnel of the Naval Medical Service were employed during the war in every quarter of the globe, and in every manifestation of British Naval enterprise Reading down the list of names on our War Memorial and observing the dates on which these gallant officers met their deaths the outstanding events of the war are vividly recalled to our minds The 31st May 1916 will remind us that at the Battle of Jutland the Naval Medical Service sustained the loss by death in action of Fleet Surgeons W J Beathlock (*Invincible*) F A Capps (*Defence*), H L Geoghegan (*Black Prince*) F F Lobb (*Queen Mary*), H L Norris (*Indefatigable*) Surgeon Lieutenant S Punch (*Indefatigable*) Temporary Surgeons G W Lewis (*Queen Mary*) M H de J Harper (*Queen Mary*) G M Johnson (*Defence*) M H Jones (*Invincible*) G B Moon, A A Morrison, G Shorland, J S D McCormac and others

The grim tragedy of the Dardanelles Expedition and the Gallipoli Beaches is brought home to us by the deaths of Fleet Surgeon Adrian Ferrester, the sinking of the *Goliath* involving the death of Fleet Surgeon J. Cox and the mining of the *Russell* when Surgeon Lieutenant P. D. Pickles, R.N.V.R., was killed outright and Fleet Surgeon W. K. Center subsequently died from burns in Malta Hospital. When Admiral Craddock's flagship, the *Good Hope* went down fighting to the last, at Coronel she took with her Fleet Surgeon J. J. Walsh, Surgeon Lieutenant J. L. J. M. de Verteuil and Surgeon Lieutenant J. C. Seile, and in the cruiser *Yarmouth*, Surgeon Lieutenant Commander H. Woods and Surgeon Lieutenant Toulmin lost their lives. With the death of Lord Kitchener in route to Russia in the *Hampshire*, we associate the loss of Fleet Surgeon P. Garnons Williams and Temporary Surgeons H. F. McNally and H. G. Chaplin. Many gallant temporary surgeons lost their lives in action.

Sir Robert here specially mentioned the following officers, quoting from despatches the deeds of gallantry which won them their several decorations. Temporary Surgeon Frank Pocock, D.S.O., M.C. and Bar; Temporary Surgeon Alfred Robinson MacMillan, D.S.C. and Bar; and Surgeon Lieutenant Commander Martyn Henry Langford, D.S.O.

Continuing Sir Robert said: "The 11th of November will ever remain a day of remembrance, a day when our nation will recall those thousands of heroes who in the prime of youth and manhood gave their lives for King and Country. We shall recall the anxious days when almost up to the Armistice it seemed uncertain whether all the sacrifices were to have been in vain. But a young generation is even now growing up around us to whom the war is a vague dream of some sad and anxious time. In a few years some of these young people will be joining this hospital as surgeons and nursing sisters. To them the names commemorated on our Memorial will be an inspiration and an example and they, like us, will learn to honour the courage and endurance and be thankful for the sacrifice made by those we memorize to-day."

Sir Robert then unveiled the tablet. The General Salute was given by the guard of honour and the buglers sounded the "Last Post." The Dedication Service was then read by the Chaplain in the unavoidable absence, through illness of the Rev. Archdeacon Ingles, Chaplain of the Fleet, who had accepted the invitation to perform this part of the ceremony. At the conclusion of the service the hymn "Let saints on earth in concert sing," led by the choir and accompanied by the band, was joined in by all present, after which the Blessing was pronounced. Immediately after the conclusion of the religious service the buglers sounded the "Reveille," and the singing of the National Anthem brought the proceedings to a close.

Two striking wreaths were afterwards placed at the foot of the Memorial, one from the Surgeon Rear-Admiral and Medical Officers of

[illegible] from the Chief of Staff Officers and Members of the [illegible] Voluntary Aid Detachment. Several smaller floral tributes were also placed under the Memorial by visitors.

## PLYMOUTH

The ceremony of unveiling the Naval Medical War Memorial erected in the Royal Naval Hospital at Plymouth was carried out by Surgeon Rear Admiral Sir Daniel McNabb, K.B.E., C.B., on October 1, 1922.

In spite of heavy and persistent rain a large and representative gathering assembled at the hospital. Fortunately for all those witnessing and taking part in the ceremony, shelter from the rain was afforded under the roof of the colonnade, where the memorial has been placed.

Amongst those present were the Mayor and Mayoress of Plymouth, Surgeon Vice-Admiral Sir Arthur and Lady May, Surgeon Rear Admiral Sir William and Lady Pryn, naval medical officers of the Port with their wives, and many others, including relatives and friends of those whose names were commemorated on the Memorial.

The proceedings commenced at 3 p.m. with a short religious service held by the Rev. J. D. McIlurtby, M.A., Chaplain of the Hospital.

Sir Daniel McNabb, in the course of an eloquent address, said they were assembled there to do honour to their comrades who had displayed the highest attributes of their profession and of the Navy right through to the bitter end. We know that any medical man who offers his services in whatever line of life with which he might be associated is engaged in one prolonged conflict. It might be in individual cases of illness or disease with the object of saving life, or on the other hand, it might be against the conditions arising from civilization, or the want of it, for the benefit of the community at large, so that they might reap the reward of the knowledge and experience of these medical men.

Continuing, Sir Daniel said they could not tell exactly how many men lost their lives in the prolonged warfare, but they did know that every epidemic brought its toll of such heroes, most of them unrecognized. Therefore whenever the opportunity arose of commemorating the names of those who had lost their lives in the performance of their duty, it was only right that advantage should be taken of it, not only for the honour of the ideals of the Service to which they belonged, but also for the comfort of those who were committed to their care, and for the satisfaction of their friends and relatives.

Although the sense of duty was keen, yet there was something far above that, and that was the feeling of comradeship—the quality which bound together the members of a ship's company in one harmonious whole. It was that feeling of comradeship which was uppermost in their minds that day, and the persons whose names were engraved on the tablet were and

(Photo. by Ba

THE UNVEILING CEREMONY AT HASLAR.

[illegible] days would [illegible] friends. They [illegible] the Navy and Army and paid the [illegible]

Sir Daniel paid a warm tribute to the grand spirit [illegible] men and women who keep their civil work and take their place [illegible] in the naval hospitals.

After the service had been concluded all present joined in the Lord's Prayer. God save the King, prefaced by a prayer for the Royal Family. The proceedings were concluded with the Benediction [illegible] the National Anthem.

The Memorial has been placed [illegible] the colonnade facing the hospital grounds. The [illegible] the tablets erected at Haslar and Chatham. The [illegible] are specially cast so as to include the memory of Lieut. Commander Davis and the sick berth staff in addition to the names of the medical officers and nursing sisters and members of the V.A.D.

After the ceremony two very beautiful wreaths were placed at the base of the memorial one from the sick berth staff and the other from the pensioners.

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## CLEAN AIR

BY LEONARD HILL, M.D., F.R.S.

A Popular Lecture delivered to the Congress of the Royal Sanitary Institute at Bournemouth in [illegible]

Men and women live long who work in the dust-producing trades. The fact that the expectation of life (1911-12) of females at Leek in Staffordshire was at 7 years in Middlesbrough 30.7. This is not merely a matter of greater infant mortality for it applies to the adult population and to adult years. Similarly the young adult females Surrey County Council analysis of nine years over smoky industrial Oldham where the infant mortality per 1,000 living, on the whole for males is one third greater than the rural mortality in proportion which has not changed in the last fifty years although the mortality has been generally lowered. This difference is very striking, considering the good water supply, drainage and housing of the cities and the higher wages earned by city workers.

In the medical grading of the recruits for the Army of 1914-1918 70 per cent. of coal miners who did strenuous work in well ventilated mines, with good pay and ample holidays, were graded I whilst only 20 per cent. of a

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[1] Reprinted by permission of the Committee from the *Journal of the Royal Sanitary Institute* for September 1922.

sample of cotton operatives were so graded Taking the clergy [illegible] on account of their more blameless lives and greater freedom [illegible] stress we find at 35 to 45 the mortality per 1,000 for the clergy was 3·15 for agricultural labourers 4·9 for cotton operatives 6·52, and for shoemakers 7·83 At the age 55 to 65 the respective figures were 21·92 17·32, and 26·13

We have done in recent years a great deal to reduce infant mortality and to preserve and make happier the life of young children but we have done much less to extend the life of the adult Dr Greenwood has pointed out that Sweden has a higher mortality in later childhood and adolescence than we have, but stands far better in the length of life and continuance of working power of its adult population Thus the mortality figures for males 1906 10 are, ages 15 to 20 England 3, Sweden 4 3 ages 35 to 45, 8 6 and 7 1 ages 55 to 65, 31 0 and 20 1 In 1916 (the latest figures before me) Swedish males 45 to 55 55 to 65 had 10 01 and 19 35 as rates of mortality In 1920 (our lowest record) 13 3 and 25 2 are the English rates Our men of 45 to 55 died faster than the Swedes in 1916

In this country tuberculosis still kills and maims each year almost half as many civilians as the great war did of our soldiers in 1920 42 545 persons died of tuberculosis, 9 1 per cent of all deaths In Japan there is now happening just what happened in England during the rise of industry at the beginning of last century Some 210,000 fresh girls are coming annually into the cotton mills from the country districts, while some 80,000 girls in the mills are annually discharged for sickness and no less than 70 per cent of all their deaths is due to tuberculosis

There are two chief factors at work undermining the health of the city worker firstly, an ill-chosen diet secondly confinement indoors in dim sunlight filtered through glass in a stagnant atmosphere with the body generally overclothed and kept too warm

Ill nutrition may arise because food is deficient in energy value or in quality or because the environment depresses the fire of life and reduces the healthy action of the bowels and the appetite or because the body is overfatigued and the expenditure of nerve energy leaves insufficient for the digestive and absorptive functions In Prussia 16 861 persons died of tuberculosis in 1913 In 1919 the smaller population weakened by privations, suffered 85 996 losses from this disease Over fatigue is, no doubt, one of the great causes of consumption, and those who carry out in factories skilled hand operations, doing piece work or keeping up with the pace set by a machine, seem specially liable to it Heavy workers suffer far less, *e g* coal miners, smiths, and foundry men, and agriculturists Boot and shoemakers printers and cabinet-makers have a relatively high mortality from consumption Merchant seamen are confined in very close quarters on board ship have a rate thrice that of coal miners Heavy workers make relatively few movements (moving legs and body as well as arms), they breathe deeply have a high rate of food oxidation, and require, and generally

secure good ventilation many working out of doors The light hand workers lead a far more caged and less well-ventilated life using their hand muscles to make many small, fine movements not using their big body and leg muscles not breathing deeply not having a high rate of food oxidation The chest is fixed to make skilled hand movements and this modifies their breathing The number of fine skilled movements they have to make brings about nervous fatigue while their food oxidation being relatively low and breathing shallow the onset of fatigue is not resisted as it should be by a high rate of nutrition The relatively warm environment brings too much blood into the skin of the factory workers and does not tone up the body as the open air life does Infection with catarrhal complaints is far more spread among them and their respiratory membrane is not kept in a healthy state as it is in those who breathe deeply cool air Children who are over crammed for examinations come under this category so too many college students and clerks

Insurance returns show that in some occupations 40 per cent of the workers may be away from work each year for some period owing to sickness, while the number of cases seeking medical relief may number 100 per cent of the workers or even more each year The economic loss is gigantic Sir George Newman estimated that the working population loses more than 270 000 years of working time annually from sickness

Millions live in one to three roomed tenements and the cinema and a sensational Press take the place of fun and frolic in the open air The caged crowded life of the tenement lowers the vitality and exhausts the nervous system Ill feeding comes on top of this the workers having no garden to give them fresh vegetable foods An enormous economic loss results from their having no chance of spending their leisure hours in gardening and in improving their houses

It is recognized by educational authorities that children require a change and a run round in the open air every hour to keep them fresh for lessons Factories should be built narrow so that they can empty quickly with playing courts around where workers whose needs are no less can secure a few minutes relaxation The building of acre big workshops is against the reasonable control of the workers health A greenhouse atmosphere is often obtained in big factories lit by skylights

Children require change in their lessons, and a change of occupation is as good as a holiday No attempt is made to bring this about in factories By changing shops and changing work hateful depressing monotony would be avoided and freshness obtained There are workers who follow all day exhausting operations, which brings them to an early breakdown A change to a light, easy occupation for half the day could easily be arranged by wise co ordination of work in factories. The war has shown how quickly a man a boy, or a girl learns a process which was considered skilled It is nothing to human endeavour to learn half a dozen processes, and escape from monotony by changing from one skilled occupation to

[illegible] this it is up to them to bring abo[illegible] [illegible] leaders are far from recognizing [illegible] human [illegible]

The [illegible] real food living out of doors in the [illegible] well ventilated thickets, protected by [illegible] enemies but happy in the [illegible] the wild asses of Sind the hunter [illegible] Irish horses— they sniffed up the [illegible] civilized man has to have a book [illegible] to catalogue his diseases Dr McCarrison [illegible] Himalayas a tribe of magnificent [illegible] the characters of youth unusually [illegible] such a tribe carried according to [illegible] loads of over 100 lb up a pass [illegible] 11,000 ft One girl so carried a tent [illegible] Their food is milk and [illegible] grains fruits and leafy vegetables [illegible] tunnel tools or millers refined food products almost [illegible] little alcohol Their bodies are vigorously exercised [illegible] open air and bathed with sunlight Amongst these [illegible] of neurasthenia no gastric or duodenal ulcers no appendicitis [illegible] little [illegible] cancer Dr McCarrison says that [illegible] to operate for senile cataract but to provide [illegible] and so mitigate the trouble of over-population The [illegible] was for the son to carry his aged parents in a basket to the top of a rock and cast them down Over population drove some [illegible] of this tribe into settlement in a new district with poor soil, there, having to largely on watch in place of wheat, a paralysis resulted due to [illegible] of this foodstuff Here we see the effect of ill-balanced diet [illegible] with monkeys taken from the woods and kept in big dry cages with properly chosen natural foods live healthily but on ill balanced foods and so called purified millers products they develop diarrhoea and dysentery

We must have in our food first sufficient fuel value, or energy, to keep up our body heat and to do muscular work on Next we must have proteins which will yield us on digestion all those amino acids into which proteins are split on digestion and which are required to build our tissue to secure these we want variety—best both animal and vegetable proteins Some proteins—for example, zein in maize—fail in one or other of the required constituents, and disease results from restriction to such Then we need carbohydrates and fats mainly to provide fuel but also to help build body substance. In addition we must have certain salts and particularly chloride and phosphate of sodium potassium, and calcium on which the processes of life intimately depend Lastly the food must contain vitamines traces of certain vital substances which have hitherto not been separated but have been proved to exist by feeding experiments

The [illegible] compared to the sparks which fire the petrol in a motor [illegible] A simple list of fresh meat milk butter eggs fruits honey [illegible] and wholemeal bread such as our ancestors ate supplied all but now this food is largely replaced by the products of the miller and canner, by white bread and polished white rice cornflour, sago, tapioca tinned meat, sterilized milk sugar margarine made out of nuts egg substitutes, tinned or bottled fruits Tea, sugar white bread, margarine, and low quality jam are the staple foods of the very poor The effect of preservatives and refining processes has been to lessen the vitamines and essential salts often with disastrous effect to growth, health and breeding power

There are three vitamines recognized—fat-soluble A vitamine present in certain fats particularly in cod liver oil fish roe liver egg yolk, butter and in green vegetable leaves This is necessary for growth and resistance to infective diseases Water soluble B, vitamine present in the seeds of plants egg yolk yeast and in many fruits and vegetables, necessary for health and fertility Its absence causes beri-beri a disease which has prevailed in the tropics owing to the polishing of rice, which millers introduced to make it white Water soluble C vitamine present in most juicy fruits and vegetables its absence produces scurvy

Fresh, young green vegetables eaten as salads, gives us all three vitamines, and as cooking largely destroys vitamines we all ought to eat salads The miller takes away the germ and outer layer of the wheat berry and these valuable parts are given to rabbits pigs and fowls as bran and middlings We get in white flour a meal robbed of its vitamine B and most of the very important salts of phosphorus which whole wheat meal contains I would put a tax on white flour and let finely ground wholemeal flour go free a just tax for it would promote national health So too with sugar a separated product Indulgence in sweets and cakes made of white flour and sugar may be no less harmful to health than indulgence in alcohol Rice cornflour, sago tapioca, pearl barley, pea flour oatmeal split peas and lentils are similarly impoverished by the miller What we want is wholemeal ground very fine so as to be digestible whole peas beans and lentils, salads fruits and vegetables, milk and butter of cows fed on green grass and so rich in vitamine A Stall-fed cows milk is deficient

Now the growing of salads which might be possible in gardens and courts in window boxes and on roofs in our cities, is stopped by the smoke nuisance this, too damages the fields, gardens and allotments, and lessens the supply of vegetable food and of milk of cows fed on fresh young grass and makes these things costly to city people

The damage done by smoke to property in Manchester and Salford has been estimated at one million pounds annually, or about one pound per head of population A similar estimate for London is four millions The cost of the smoke nuisance regarded as a preventable source of damage

to buildings, furniture fabrics, plant life, and human vitality has been put at 50 millions a year taking into account human happiness health and working power, it is incalculable, but at any rate very large In 1920 the rate of mortality of England and Wales was 12 4 per 1,000, of smoky Manchester 14 0 In addition there is a prodigious loss of valuable by-products which under scientific control might be saved Those by-products can be saved by the distillation of coal in gasworks and the utilization of gas for lighting and heating and of coke or other smokeless fuel for heating and raising electric power and light and steam power Professor W A Bone has estimated that over 90 per cent of the fuel value of the coal used in power production is at present wasted Only 8 per cent of the fuel value of the coal is obtained as power in electric power stations, and only 4 per cent of the fuel value of the coal used to produce it is converted into electric light In contrast to such inefficiency, the luminous efficiency of the glow-worm or firefly is 100 per cent By carbonization of coal at gasworks and the use of gas, coke and by products some 20 per cent of the thermal energy of the coal can be secured The modern radiant heat gas fires gives us some 15 per cent of the thermal energy of the coal used to produce it and the efficiency of the gas heater is almost as high

The coke used to generate steam and electricity will give us another 8 per cent The by products such as tar, ammonium sulphate, &c, are estimated to give 6 per cent By turning coke into electric power and supplying this power and gas for heating to every house home industries can be revived and life made immensely happier in garden cities By using gas coke and smokeless fuel in place of raw coal we can clean the skies and conserve the national coal stores for foreign barter and future use With the same output we shall have two or three times as much coal available—what a prodigious folly to continue the waste as at present! Turn to the effect of smoke on health and happiness

Smoke covers with dirt people and their houses, causing an enormous expenditure of human energy in cleaning, painting and redecorating of buildings and washing of clothes Smoke fogs delay the transport of goods and people with all the annoyance and loss of time and money therefrom The deposit of soot at Southwark—39 tons per month per square mile—must be compared with that in a country district like Malvern, where it is only 7 tons Dr Owen's experiments show that the pollution from coal smoke in London begins at the time of lighting the domestic fires when the fires become hot it is better at night it is nearly as small as in the country If the newly lit fire could by some means be rushed to a red heat there would be much less smoke and fog

A few years ago the people of Manchester were estimated to receive 50 per cent less actinic rays of sunlight than the people in Didsbury four miles away Leeds, it is estimated receives 40 per cent less daylight than its suburbs

The quant[illegible]d by domestic fires is estimated by Professor W A Bone [illegible] and by factory furnaces at 6 million tons in all nearly 10 million [illegible] year The domestic soot is more tarry and causes more fogs than the blue smoke of factories The choking of the leaves by tarry matter and the sulphur acids in the smoke destroys vegetation and lessens the pleasure and health derived from the cultivation of gardens and the use and enjoyment of public parks Radishes and lettuces grown at stages between the centre and the suburbs of London show enormous increases in size varying with the distance between the producing ground and the city

As I have already pointed out the destruction of vegetation is of very great importance to health, not only from the æsthetic side but from the fact that fresh green foods and milk of cows fed on such are protective foods containing the vitamines essential for health growth and breeding The want of these is one of the great causes of malnutrition, disease, infertility and unhappiness in our big cities Smoke intensifies the natural white mists and not only cuts off the light but the heat of the sun, and hinders evaporation of water thus increasing the gloom and cold humidity of the climate which impels people indoors and to sedentary occupations and pleasures in place of healthy exercise out of doors The deleterious effects so produced are vastly more important than the blackening of the lungs by inhaled soot or their irritation by sulphuric acids

There are certain dusts which are very harmful to workers in particular free silica from quartz sandstone granite &c inhaled by gold and tin miners, grit stone makers and grinders Such dust produces a degeneration of the lungs, often followed by phthisis and a very high death rate It can be stopped by suitable means of ventilation

The physical properties of the atmosphere are of great importance to health We are always consuming food and producing body heat and we have to get rid of our body heat in order to keep ourselves at the normal body temperature Hard muscular work produces far more heat than food The skin is cooled by radiation of heat to colder surroundings and by convection—by warming the air in contact with it Wind greatly aids convection There is additionally the emergency method of cooling the body by evaporation of water Every gramme of water evaporated when one sweats takes away 600 calories of heat

The bad effect of a warm moist climate, such as that of Singapore on the British is established by experience Every four years long leave in a temperate climate has to be given to re establish the health of officials and this is not enough—'many fall by the wayside The native Malays are incapable of strenuous effort Indians and Chinese are brought in to do heavy work Tropical shade conditions of climate are frequently found in room tenement dwellings ships mines and workshops through stagnancy and over-heating and humidification of the air

At the Fall River cotton factories U S A, the death rate for males

between the ages of 15 and 45 is twice, and for females thrice, that of the average. The physical labour of cotton spinning is not great—the most striking features of the spinning-room are the heat and moisture of the atmosphere. In this country respiratory diseases rise to a very high level among the cotton spinners after middle age. Similarly in the country, the comparative mortality of potters from phthisis and other respiratory diseases is two or three times greater than that of other males living in the district. The potters too work in warm atmospheres.

The air which one breathes in, no matter at what temperature it is, nor what moisture it may contain, is heated up to almost body temperature, and saturated with water at that temperature. The important thing is to keep up the health of the respiratory membrane, and this depends upon the amount of arterial blood and lymph flowing through it. During the winter at an Alpine resort, the cold air that one breathes in having very little moisture, when heated up to body temperature takes a great deal of moisture from the breathing passages. A person living in an Alpine sanatorium, taking exercise and sleeping in the open air may evaporate from this membrane in twenty-four hours several times the amount of moisture which he would if living a sedentary life indoors in London. This is a matter of great importance as the flow of moisture going through the membrane cleanses it, protects it from disease and helps it to cure cases of tuberculosis by sending more lymph and blood through the respiratory tract. It has been shown that the tears and secretion from the nose and respiratory membrane have a very great power of destroying the microbes commonly found in the air.

Cool air evaporates moisture not only from the respiratory membrane but also from the skin, hence the dryness of the skin and lips, and their tendency to chap. When doing hard work one has to perspire to keep cool, for the heat production of the body may be five to ten times greater than during rest. In the cold Alpine air in the shade it is possible to take heavy exercise, such as climbing, without sweating; the heart is thus saved from extra work, and the patient is stimulated to exercise and enjoys it more. Cool winds have the same effect in this country.

In dry hot atmospheres sweating keeps the body temperature normal, but heat stroke results if the sweat glands become exhausted through fatigue or illness. Heat stroke can then be prevented by spraying the patient with water and blowing on him with a fan.

In hot moist atmospheres loss of heat by evaporation becomes very difficult or impossible; heat-stroke is inevitable in the latter case. Warm, moist atmospheres lower health and working efficiency very greatly. The body heat production of native students in such climates is not half that of an athletic Oxford undergraduate.

The ordinary thermometer, which is so trusted, merely gives the average temperature of its surroundings. While the human body produces heat and all day long is keeping itself at body temperature, the thermometer does

not produce heat, but just registers the effect of the surrounding atmosphere upon itself. An instrument is needed, then, to record how quickly air cools and evaporates moisture from the body. The lecturer had introduced the Kata-thermometer, a sensitive instrument, and one that was considered far more indicative of human feeling than the ordinary thermometer. The Kata, as it is called shortly, is simple and easy to use; it recorded not only the effect of the temperature of the surrounding air on the cooling of a surface at body temperature but of the wind and any movement of the air, and also how quickly cooling takes place when the surface is wet, as the skin is when perspiration is going on. The Kata is a large bulbed alcohol thermometer of standard size with stem graduated from 100° to 95° F. It is warmed up in hot water till the meniscus rises above 100° F. the bulb is then dried and the rate of cooling of the meniscus from 100 to 95° F. taken with a stop watch. With the aid of a numerical factor determined for each instrument the cooling power is deduced in millicalories (1/1000 gram calorie) per sq. cm. (of Kata surface at body temperature) per second. In the case of the wet Kata a muslin glove covers the bulb. In still air the dry Kata thermometer records a cooling power of 10 at 0° C., and about 1 at 20° C. with a wind of nine miles per hour it has a cooling power of 40 at 0° C., and 20 at about 15° C., and so on with different rates of wind. Wind is far more important than temperature to the cooling of the body; thus the still, dry freezing air of the Alpine climate is easily borne. In factories, schools, &c. the reading of the cooling power of the dry Kata thermometer should not be less than 6 with a temperature of about 60° F. otherwise the efficiency of the worker and pupil will tend to go down. Out-of-door workers face a cooling power in this country hardly ever as low as 6, and generally two and in winter often three or four times as high. Observations made by the Industrial Fatigue Board researchers in potteries, boot and shoe, cotton and printing works showed that a great number of readings were below 6. The general mortality rate increased in these trades with the lowness of the Kata readings. Great improvements could yet be made and industrial unrest is to be attributed not so much to the wage question as to the working conditions of life—the confined air, filthy sticky atmosphere, lack of gardens, playing fields, &c. If factories were properly swept with moving air the risk of massive infection would be greatly reduced, and the workers stimulated to work and kept in better health.

Experiments carried out by Dr. Argyll Campbell and the lecturer at the Treloar Hospital and at the English Sanatorium at Montana showed that the heat production of the body is kept at a high level in children who lie on cots in the open air, more or less exposed nude to the wind and sun. The patients absorb and enjoy the radiant warmth of the sun, while cool air surrounds and cools the shaded part of their bodies. The body heat production of clothed adults is put up about 60 per cent., and in the case of these children 70 to 100 per cent., in some instances more, above that of those

resting in a [illegible] The appetite is thus greatly increased and as the digestion and [illegible] of food improve fuller more food principles, amino acids, salts vitamines, &c become available for resisting disease

The sun warmed diseased parts and evaporating moisture from sores and sinuses maintained a greater flow of blood and lymph through these parts The cool, dry air also increased such evaporation &c Ultra violet rays were absorbed by the surface and caused pigmentation of the skin and the pigment prevented sunburn Patients required to be gradually exposed to the sun and allowed to pigment, they must not be sunburnt or overheated The lecturer's experiments showed that the power of the sun to effect biological changes can be controlled by the cooling power of the atmosphere

The immense importance of exposure of the body to sunlight and cool fresh moving air is shown by the wonderful cures effected in cases of tubercular disease of skin glands, joints and spine for example at the Trelour Hospital under Sir Henry Gauvain, the Queen Mary s Hospital for Children (M A B) under Dr Pugh and at the Alpine Sanatorium at Leysin under Dr Rollier, a pioneer in these methods The children at Leysin play, attend school, and do field work naked except for a loin cloth and become brown as niggers, not only in summer but in winter At the Trelour Branch Hospital at Hayling Island they not only play naked on the shingle beach but bathe in the sea The exposure to cold which sickly slum children easily and quickly come not only to withstand but derive benefit from is astonishing, particularly to those who have been brought up by mothers and grannies in the erroneous belief that exposure to cold is the great cause of illness You may see a child sitting up in bed at the Trelour Hospital in a draught from a window on a November day with its night shirt slit from the neck downwards so that its little body may be well ventilated It might snuggle down under the bedclothes and put its feet to the warm bottle provided but it does not care to It wants to sit up and play, and does not feel the cold any more than a wild animal The cool moving air stimulates the body to keep itself warm by oxidizing the food which having been eaten is digested and absorbed into the blood The fire of life is made to burn brighter Those who shut themselves up in the stagnant air of warm rooms are kept warm artificially and have the fire of life in their bodies correspondingly depressed to a low level Cool moving air by stimulating the oxidizing processes, makes us breathe deeper to get in more oxygen quickens the circulation, and provokes appetite It impels us to take exercise—the natural method of keeping warm Exercise, in its turn makes the circulation and the breathing far more active The organs within the abdomen are massaged by the movements of deep breathing, and this massage, combined with increased circulation and oxidation, prevents constipation and the poisoning of the body by products of bacterial decomposition which may arise in the bowels of sedentary workers Sedentary life indoors may be balanced by open-air exercise in leisure

[illegible] tendency leisure be spent in [illegible] cinemas theatres meeting [illegible] and in bed with the windows shut [illegible] the whole twenty four [illegible] the day are spent in approximately tropical shade conditions

Some factories, spinning mills and weaving sheds have to be kept at a high rate of humidity for the purpose of manufacture and in these by the introduction of steam, the climate is made like that of Singapore Great improvement can be brought about by the use of fans

We have a wind tunnel in the Institute of the Medical Research Council provided with a revolving band on which we can walk or run at given speeds, it has a fan for cooling us by various velocities of wind Observation shows us that adequate cooling keeps down the pulse it may be 120 in the wind in place of 150 in still air when doing heavy work This is because the heart is spared from having to send so much blood to the skin and sweat glands to cool the body By adequate ventilation, then, heart fatigue may be kept off, and the period of working efficiency so raised Probably in very many people the heart beat is kept too frequent by over-warm surroundings People in the tropics grow old quickly and have shorter lives One cause of this may be exhaustion of the vital power of the heart by its more frequent beat

It has been shown that the efficiency of the native workers in the South African mines is lowered 50 per cent where the galleries are hottest, and in a whole mine the efficiency was calculated to be 21 per cent less than it would be with ventilation as measured with the Kata thermometer, adequate to keep the workers comfortably cool Gigantic economic losses arise then from ill ventilation

Not only consumptives but all cases of fever—for example, measles and pneumonia—are treated with great advantage in open air shelters The wounded do exceedingly well in hospital sheds built on the plan of the verandah or in tents, a larger proportion die from septic infections in close crowded buildings Delicate children, those subject to colds, those with weak hearts, those over nervous in temperament, those in risk of tuberculosis when sent to open air schools and given good food adequate rest and open-air exercise grow so fast in weight that their growth curves escape from the official charts used for records Lunatics too, are soothed and brought to recovery quicker and in large numbers by open-air treatment Tens of thousands of weedy citizens, conscripted in the war, well fed and exercised in the open air, broadened out and became handsome virile looking soldiers, so developed that their old time "civvy clothes were useless to them when they had been demobilized

Trial has proved that cows with their natural coat of hair—they have no overcoat to put on—yield more milk and improve more in condition and breed better when wintered out in the open fields that when kept in stalls and that stall-feeding is the cause of tuberculosis in them All this is known to the observant, but yet the mass of people are imbued with the

from fear of cold of exposure to weather, they have reared their children within doors, overheated their bodies, overheat their houses and lead a caged life, wholly different from the life of a wild animal from that of a wild man from whom we are descended, and yet they inherit a body tuned to fight the rough conditions of the world through hundreds of thousands of years of man's existence thereon

The common belief is that a close atmosphere acts harmfully upon us through the chemical impurity of the air, that there is too little oxygen or too much exhaled carbonic acid in such or subtle organic poisons supposed to be exhaled in the breath, or from the bodies of people This erroneous chemical theory has done the greatest harm to the development of our cities for it has been accepted that, so long as the air came up to certain chemical tests of purity no mischief was done thus slum dwellings and cavernous places of business were permitted by the State to grow up in place of garden cities The land exploiter and jerry-builder for a hundred years have had their way untrammelled, and we now have vast areas closely covered with mean houses an evil so gigantic as to be almost irreparable

The truth is that the concentration of oxygen is never reduced in the most crowded, close atmosphere to anything like the extent it is in mountain health resorts where the air is attenuated owing to altitude Further the concentration of carbonic acid in the depths of the lungs is always kept at about 6 per cent of an atmosphere, the breathing is so regulated as to keep it at this figure A little more carbonic acid in the air only excites in us a little deeper breathing just as exercise does, owing to the production of more carbonic acid in the body, and it is only when the carbonic acid rises to a concentration which is never approached in a close room that any loss of efficiency arises from the deepening of the breathing

The crews of submarines find on submergence that the confined air can be endured until the carbonic acid reaches 3 per cent and the oxygen is correspondingly diminished Fishermen greatly exposed to cold by day shut themselves up in cabins and sleep in an atmosphere where the oxygen sometimes becomes so reduced that the lamp goes out, and no harm comes to them from this On the plateaux of the Andes there are great cities where the people are acclimatized to a concentration of oxygen equal to some 14 per cent, instead of the normal 21 per cent of an atmosphere at sea level

As to the presence of organic poison in exhaled air the most careful and repeated experiments by the best physiologists in various countries have failed to reveal this The assertion that there were such poisons was made on the evidence of untrustworthy experiments which, unfortunately, gained the widest attention and credence and popular writers and lecturers on hygiene preach a false doctrine which it is considered almost irreligious to contravert

[illegible]

[illegible] the germs of disease

(2) [illegible] its lack of [illegible] and evaporation [illegible] on the skin and the [illegible] membrane

The [illegible] infection—colds [illegible] influenza, measles [illegible] spray coughed [illegible] by carriers of [illegible] in massive doses [illegible] close [illegible] direct contact [illegible] The germs of typhoid [illegible] and similar [illegible] may be spread by [illegible] the soiled [illegible] of carriers [illegible] handling food with soiled hands for example a carrier [illegible] typhoid fever in some cases [illegible] to pass a virulent strain of [illegible] his urine and if he be [illegible] his hands soiled with his urine [illegible] transmit this disease to others The evacuations of carriers may pollute [illegible] supplies through drainage leaking into wells streams [illegible] may carry infection by [illegible] evacuations to food, the germs which inhabit wounds may be spread by dust from skin and soiled clothes or bedclothes the germs of other diseases are spread by the bites of insects e g malaria by the mosquito and trench fever and typhus are spread by body lice The germs of venereal disease, potent in after effects and in inducing the efficiency of the nation are spread by direct contact The infective diseases not only produce illness and death at the time of infection but may leave behind degeneration of tissues which weaken efficiency and shorten life

We want to keep our bodies healthy by sufficiency of good food and exercise in the open air, and adequate rest so that we can resist infection —this is the first essential Secondly, we want to reduce the massiveness of infection from the carriers of the germs of disease We might have been able to withstand 10 000 or 50,000 German soldiers landed on the East Coast, and yet have been beaten by half a million , so, too, with germs We become immunized by small doses and fall a victim to large ones Natives first coming in contact with the diseases of civilized man are thus unprotected and suffer very greatly in consequence Places where people are crowded together require to be very well ventilated Wind sweeps away spray infection and prevents massive doses being inhaled. Sunlight is a great germicide, killing all the germs it can reach Milk for babies is kept sweet by cold, while microbes multiply in it when kept warm Much of the milk that comes to town is dirty Dried milk amplified by orange or turnip juice to make good vitamine C, may be used with advantage for babies in tenement homes Mixed with water for each meal, it is clean

Diseases spread by the flea, louse fly &c , are kept away by cleanliness of body, house and midden. Thorough cleaning, as ordered in the Book of Leviticus, will keep venereal disease even from those who expose themselves to it

I must now turn to consider more particularly the influence of sunlight It is known that the light and heat of the sun keeps going the manifestations of life. Plants energized by the sun, and using, as a sensitizer to light the green chlorophyll build up their substance out of inorganic materials This substance is the food of the animal world Modern theory now suggests that all chemical change vital and non vital is touched off by radiant energy by light or heat, and that the speed of such change is determined by the intensity of radiation The sun rays which are most active on living cells, killing these if too strong are the ultra-violet These are also the rays that act most on a sensitized photographic film They are absorbed by the surface and do not penetrate living substance They change and in too great intensity destroy, living cells, microbes but act only on the surface

The visible rays in part are reflected from the skin and in part penetrate and are absorbed by the blood It has recently been shown that the skin can stand, without being scorched twice as much radiant energy in the form of visible sun rays as it can of dark heat rays, because the visible rays largely penetrate, and warming the blood locally are carried away as heat to cooler parts of the body The dark heat rays, absorbed by the surface of the skin, makes us feel warm and stuffy indoors Out of doors on the other hand the blood is warmed by the sun while the surface of the skin is fanned and cooled by the breeze

The ultra-violet rays are largely filtered off by glass Exposure in rooms lit by windows is not the same as exposure to light out of doors Some French observers claim that the long rays balance the short rays for example that the bleaching effect of short rays is checked by the throwing in of long infra-red rays so, too, in the case of pigmentation of the skin If confirmed these are notable facts We may suffer from an ill-balanced radiation indoors In heating our rooms with hot water and steam pipes we expose ourselves to infra-red rays, gas fires give us chiefly infra-red and red rays, electric light has the infra-red and ultra violet largely cut out by glass globes While the naked arc light gives us all the rays, the mercury vapour lamp in a quartz globe gives us green, violet and ultra violet rays The flames of a fire give us a nearer approximation to sunlight There is no healthier means of heating than a blazing log fire out of doors We like a fire best but as it fouls the sky with smoke and cuts off sunlight, we must take to gas or smokeless fuel fires as the next best thing These and open windows give us the most healthful conditions The dark heat of steam pipes and the stagnant warm air of shut up rooms depresses health (exposed as we are indoors to massive infection) and makes us less resistant to catarrh, pneumonia, &c

We know that the sun rays, combined with exposure to open air, acting on the blood and cutaneous tissue, increase resistance to disease Recently it has been shown, first in Germany, then in America, and now by English workers in Vienna that rickets can be cured in children by

exposing them to sunlight even while continuing the ill balanced diet on which they had developed the disease We know that rickets affects the children of wealthy Hindus who confine their women and children in the purdah, and not the children of the poor who are fed on a much less costly diet, but who play in the open air So too rickets affects the children of Glasgow workmen who live in tenements in high houses and get little open-air exercise or exposure to sun, while the children of the Hebrides or West of Ireland cabins have none The latter get more natural food and more light and air So, too with puppies, pigs cattle and animals in the Zoo ill-balanced diet and confinement in dark places make for ill-health and greatly depress breeding power Rats put on a diet of white flour with some of the necessary salts, but deficient in phosphorus, get rickety bones and waste away after a couple of months Addition to their food of enough salt of phosphorus or cod liver oil or exposure to the mercury vapour lamp or the sun for a short time each day will prevent the formation of rickety bones, while not stopping the wasting away of the animals The effect of exposure to light can be measured in terms of cod liver oil or salt of phosphorus The blood of rats so fed is deficient in inorganic phosphorus, and the daily exposure to light puts the amount of this up Here we have remarkable evidence of the value of light and this light must contain ultra-violet rays Light passing through glass is robbed of the useful rays What folly to filter so much sunlight out of our lives by glass windows, over-clothing and smoke!

The physiologist can help greatly to point the way of happy and healthy life but ignorance and custom heavy as lead wrap people and it is problematic now whether our civilization will not stifle itself as older civilizations have done and die out Discipline of children in the laws of health, which include moral restraints and a wise control of breeding alone can save it.

# Original Articles.

## THE MIRACULOUS IKON OF TINOS

By Surgeon Commander [illegible] COPL[illegible] [illegible] R.N.

In the little island of Tinos, one of the Cyclades, in the [illegible] the [illegible] in the Church of the Assumption, [illegible] the [illegible] V[illegible]gin—the most renowned of all the ikons of [illegible]

It is [illegible] with miraculous powers, and at the time of the illness of King Constantine of Greece in 1913 it was transported from the island to Athens with great pomp and in a man-of-war, so that the king could kiss it and be cured. It went back to the island with even greater honours when the king became convalescent.

On the feast of the Assumption in August, this image—an old Byzantine painting of the Virgin, covered as all these famous ikons are, with gold, silver, and jewels—is carried in state through the little town, which is crowded with excursionists from all parts of Greece who have made the pilgrimage thither—a mixture of a holiday and a religious duty, apparently much to their enjoyment.

Let us picture the scene.

A burst of music from the forecourt of the church, and the mass of pilgrims surges forward like the waves of the sea driven by the wind. Packed into enclosures and windows, on blocks of stone and balconies, impatiently they turn their heads to see what is happening, while in the square in front of the church they are wedged into a solid mass. Looking up at the houses these latter appear to be festooned with humanity as a vine with bunches of grapes—a multi-coloured throng in which mingle women's bright coloured head kerchiefs, red fezzes, gaudy parasols and black hats.

From the church to the end of the sacred way two endless black streams extend like snakes—the two lines of people waiting by the side of the road. But even the roadway in the middle is not empty. The halt, the maimed, the blind, lepers, consumptives, a mass of suffering humanity, they have been brought there and are spread out in lines in the roadway, body touching body, side by side, and fill the middle of the road, so that the wonder-working image may pass over them, so that the Virgin may pity and cure them.

Clothed for the most part in the tattered rags of misfortune, old clothes bleached by time and black coats turning green with age, with bodies consumed with unimaginable pains, and limbs contorted and rendered useless by disease, they lie spread out before us—a veritable living pathological museum.

At last! The procession appears—a confused noise out of which the

[illegible] at the [illegible] with their [illegible] slowly [illegible] instruments twinkling in the sunlight

Following them come the holy banners—a rising, multi-coloured mass of gold and embroidery—and after them lamps crosses winged angels and cherubim glittering in the morning sun

In the middle of the crowd of priests the bishop appears stately in his gold embroidered robes his mitre glitter with precious stones, advancing slowly and leaning on his pastoral staff

And near him, carried in the arms of a priest the wonder working ikon sparkling with gold and diamonds outshining the sun in its splendour —glorious and light giving—a vision for the eyes of the faithful

Following the ikon come the officials—the Governor the Mayor and the officers of the warships in full dress—and lastly the sailors of the escort with their rifles at the slope

Crowding in behind come the pilgrims—an endless procession, covering the whole road overflowing into the empty spaces round the tail of the procession lost in a cloud of golden dust

The air is full of the enervating smell of incense of chants mingled with the continual throb of bells, and with the notes of the march played by the band

Eyes grow moist bodies shudder with holy emotion incessantly and nervously hands make the sign of the Cross voices cry —

> Blessed Virgin help me
> Holy Virgin perform a miracle for me

From all the balconies and windows nothing can be seen in the crowd but a continual fluttering movement of thousands of hands making the sign of the Cross, while small earthenware censers in each house or hut send up their threads of smoke from burning incense, and lips whispar requests and prayers

Hysterical women their eyes wet with neurotic tears emit piercing shrieks others weep spasmodically with tear sodden faces, or compress their lips in the effort not to shriek

From the balconies and pavements a rain of flowers falls on the image and those round it

The procession continues The priest with the ikon strides over the bodies of the sick who water the hard stones of the road with their tears

> 'Holy Virgin pity me give me back my health

Many of them remain in their places even after the passage of the ikon as if hypnotised, others have nervous crises, are shaken by spasms and tear at the stones with their nails All shed tears of nervous excitement

Generation after generation passes away History, glory and legends are forgotten in the dust of ages, the past and its heroes are shrouded in

[illegible] still the least of the Virgin of Tinos continues Still hope springs eternal in the breast of the mother, husband, wife or friend who brings the ailing, loved one to be cured by a sight of the wonder working image of the Virgin Mother, the story of whose love and life will remain for ever to bring peace and gladness to the hearts of every succeeding generation

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## THE GERMICIDAL EFFICIENCY OF CERTAIN ANTI-VENEREAL PROPHYLACTICS.

BY SURGEON LIEUTENANT COMMANDER F J PRISTON M B M R C P D P H R N

A GREAT many substances have been recommended for the prophylaxis of venereal disease but little attention appears to have been paid to the comparative germicidal efficiency of these substances

Metchnikoff and Roux inoculated four monkeys and a man with material from syphilitic patients, an hour later the man and one monkey had the site of inoculation rubbed for five minutes with 25 per cent calomel ointment neither developed syphilis Twenty hours after inoculation another monkey was similarly treated it developed syphilis Two monkeys were not treated at all both developed syphilis

It was found from other experiments on monkeys only, that an ointment resembling the naval calomel cream would prevent syphilis if rubbed into the site of inoculation within 18½ hours

These experiments do not appear to have ever been confirmed but Neisser found that complete excision of the lesion eight hours after inoculation did not prevent infection

It seems difficult to understand how the local inunction of calomel cream could be more effective than complete excision, moreover, the experiments of Metchnikoff and Roux were made principally upon monkeys which have a high resistance against syphilis Apparently only one man was inoculated and he was treated with calomel cream one hour later Whether he would have developed syphilis if he had been treated two or more hours later, or if he had not been treated at all, is uncertain

Calomel cream is extensively used not only to prevent syphilis but also to prevent gonorrhœa and its inefficiency, particularly with regard to gonorrhœa, has long been suspected I have myself seen several men who contracted either gonorrhœa or chancroid although they had so far as could be ascertained, rubbed in calomel cream most thoroughly immediately after connection

The following experiments were undertaken in order to determine the relative germicidal powers of calomel cream and certain other prophylactics

No satisfactory method of testing the effect of disinfectants upon the

gonococcus or *Treponema pallidum* has yet been devised for both these organisms die too easily under artificial conditions and the latter is most difficult to cultivate under the best conditions outside the body. The organisms used for these experiments were therefore *Bacillus typhosus* (Rawlings) and *B. prodigiosus*, neither of which has more than an average resistance against ordinary disinfectants.

It may be that the gonococcus or *T. pallidum* has a lesser or greater resistance than the organisms chosen, but until this is proved it seems reasonable for practical purposes to assume that the resistances are much the same, or if the assumption is considered unwarrantable it is likely that germicides which act powerfully on the organisms chosen also act powerfully on the venereal organisms.

First, the carbolic acid coefficients of the following substances were estimated:—

| Disinfectant | Approximate carbolic acid coefficient | Strength required to kill *B. typhosus* in 10 minutes at 22° C. |
|---|---|---|
| Phenol | 1 | 1 in 130 |
| $HgI_2$ soap, hard, 1 per cent | 9 | 1 in 1,200 |
| $HgI_2$ soap, soft, 1 per cent | 12·5 | 1 in 1,700 |
| Naval soft soap | Less than 0·3 | Does not kill at 1 in 40 |
| Potassium permanganate | 33 | 1 in 4,500 |

The method used was a modification of the Rideal-Walker. 0·25 c.c. of a young broth culture of *B. typhosus* (Rawlings) was exposed for ten minutes to various dilutions of each disinfectant made up to 5 c.c. in the presence of 0·2 per cent. of gelatine, 0·2 per cent. of powdered starch, and 5 per cent. of broth.

The mercuric iodide soap used throughout these experiments was a proprietary brand containing 1 per cent. of mercuric iodide in combination.

The apparent superiority of the soft mercury soap to the hard mercury soap is probably due to the difficulty of dissolving the latter. Experiments were also made with naval hard soap, but it was found impossible to dissolve this properly. The strongest solution that it was possible to make did not kill *B. typhosus* in ten minutes. With each disinfectant a control series of phenol dilutions was put up, and these gave uniform results.

The various disinfectants were dissolved in distilled water, and it was thought that a hard water, by precipitating the soap might have an unfavourable effect on the mercury soaps. Dilutions were therefore made up using a hard tap water (26 parts of hardness per 100,000). The hardness present was sufficient completely to precipitate the soap in the dilutions used, but the disinfectant power was the same.

It is impossible to test ointments by the Rideal Walker method so the following experiments were carried out to imitate the conditions under which anti venereal prophylactics are employed

A piece of chamois leather was cut into strips 4 in by 2 in, the pieces were sterilized sufficiently by bringing slowly to the boiling point and then cooling longer boiling made them curl up and became hard, they were then gently rubbed up in a mortar with an emulsion of *B prodigiosus* Each piece was thoroughly rubbed and kneaded with bare hands in a disinfectant for five minutes carried into another room to minimize airborne contamination of media rinsed under a running tap and four pieces were cut out of the centre with sterile scissors and dropped into four broth tubes which were incubated for forty-eight hours The results were as follows —

| | |
|---|---|
| Hot soap hand | Staphylococci grew in all tubes |
| Potassium permanganate 1 in 2 500 | *B prodigiosus* grew in all tubes |
| Me Ce Fa ointment | *B prodigiosus* grew in all tubes |
| Calomel cream | No visible growth in any tube sub cultures from all the tubes showed staphylococci |
| Naval soft soap | *B prodigiosus* grew in all tubes |
| Soap water alone | *B prodigiosus* grew in all tubes |

Me Ce-Fa ointment is a German proprietary substance which was found on analysis to consist of 0 73 per cent of thymol in a vaseline base It is presumably made by working up crude thymol oil in vaseline, and, if so, contains 3 per cent of crude thymol oil.

In the case of the soaps the strip of leather was rubbed in a stiff lather between the hands as a man might in washing himself

The calomel cream and potassium permanganate were thoroughly rubbed into every part of the leather and all over my hands

The staphylococci which grew in some of the tubes in this and other experiments presumably came from the sweat of my fingers, a similar organism grew freely on a plate smeared with my fingers after thoroughly washing my hands with hot water, soap, and disinfectants, and then rinsing off the disinfectant The tap water used for rinsing the chamois leather was practically sterile, and no staphylococcus could be found in it on plating

Staphylococci have repeatedly been grown from the hands of surgeons after the most careful preparation, and it appears that they live normally in the sweat glands and cannot be killed by any ordinary disinfection

These experiments showed that under the conditions stated Me-Ce-Fa ointment naval soft soap and 1 in 2 500 potassium permanganate would not kill *B prodigiosus* The mercury soap and calomel cream prevented the growth of *B prodigiosus*, but it was uncertain whether this was because the bacilli had been killed by the treatment in the chamois leather or because the mercury salts still present in the leather had inhibited the growth of the bacilli in the broth.

It was impossible to wash the calomel cream out of the leather with plain water although the mercury soap could apparently be entirely washed out It may be noted that staphylococci grew in the mercury soap tubes thus showing that there was not enough mercury present in the broth to inhibit them, on the other hand, in the calomel cream tubes there was no visible growth although staphylococci were present and alive This shows that there was sufficient mercury present in these broth tubes to inhibit but not to kill staphylococci No *B prodigiosus* was found alive after forty eight hours incubation, but whether these had been killed by the original five minutes treatment with the calomel cream or the subsequent forty-eight hours incubation in broth containing a considerable amount of calomel cream was uncertain

The experiment was therefore repeated with an alteration

The pieces of chamois leather were prepared and treated with the disinfectants as before six broth tubes were then inoculated from each piece as follows —

First pair Pieces cut from centre of leather

Second pair Pieces cut from centre of leather followed half an hour later by a loopful of the living *B prodigiosus* emulsion from the mortar

Third pair Loopfuls of the juice expressed from the cut surface of the leather these contained a minimum of the disinfectant

The following results were obtained after forty eight hours incubation microscopical examination, and plating —

| Disinfectant | Broth tubes | | |
|---|---|---|---|
| | First pair | Second pair | Third pair |
| $HgI_2$ soap, hard | Staphylococci only were present These grew freely | Many *B prodigiosus* and a few staphylococci grew | Staphylococci only were present These grew freely |
| Potass permanganate, 1 3000 | *B prodigiosus* grew freely | *B prodigiosus* grew freely | *B prodigiosus* grew freely |
| Calomel cream | No living organisms present | No living organisms present | Free growth of *B prodigiosus* |
| Lanoline base of calomel cream without calomel | Free growth of staphylococci and slight growth of *B prodigiosus* | Free growth of staphylococci and slight growth of *B prodigiosus* | Free growth of *B prodigiosus* |

It will be noticed that *B prodigiosus* grew in the second pair of mercury soap tubes showing that there was not sufficient disinfectant present to inhibit the bacilli whilst they did not grow in the first and third pairs showing that they were killed by five minutes washing with the soap

*B prodigiosus* grew in the third pair of calomel cream tubes showing

that the bacilli were not killed by five minutes treatment with the calomel cream, but no living organisms were present in the second pair which had been inoculated with bacilli known to be alive, showing that the large amount of calomel cream adhering to the surface of the pieces of leather in those tubes had been sufficient to kill the bacilli after forty eight hours

Calomel cream has the following composition

| | | |
|---|---|---|
| Levigated calomel | 4 | Parts by weight |
| Paraffin liq. B P | 1 | |
| Hydrous lanoline | 7 | |

Thorpe's 'Dictionary of Chemistry' states that lanoline has antiseptic properties, it was therefore thought desirable to find out how far the effect of calomel cream was due to the lanoline base A mixture of one part of B P paraffin and seven parts hydrous lanoline was therefore made up and tested in the same way as the calomel cream with the results given above

It will be seen that there is some evidence of inhibition of *B prodigiosus* but that staphylococci grew freely

Potassium permanganate, 1 in 2,000 was unable to affect the growth of *B prodigiosus*

Cost —The makers of the mercuric soap are prepared to supply tablets 2 by $\frac{1}{16}$ by $\frac{1}{4}$ in in cardboard cartons at a cost of 3d each wholesale Tubes of calomel cream ready for use cost rather under 1d each The tablet of soap however, can be used repeatedly whereas a tube of calomel cream can only be used once The tablet of soap is grooved so that it can be broken into three pieces, one of these pieces dissolved in 16 ounces of hot water makes a solution of 1 in 100 mercuric iodide soap which is six or seven times as potent as 1 in 2000 potassium permanganate and is stated to be non-irritating although I have not tried it for urethral injection

## Discussion

Calomel is only soluble in water to the extent of 1 in 250 000, the venereal organisms which it is desired to kill are suspended in a watery serum which will not mix with the lanoline in which the calomel is suspended Presumably the effect of the calomel cream is due to the minute trace of calomel dissolved out of the calomel cream by the water present This is certainly capable of inhibiting the growth of organisms and will kill them in time especially when assisted by the slight antiseptic properties of the lanoline but as will be seen by the foregoing experiments, it is a feeble disinfectant It has been contended that the calomel in the cream follows the organisms into the body, but there is no proof of this and it is well known that no method of disinfection with ordinary disinfectants will kill organisms present in the deeper layers of the skin of patients about to undergo surgical operations This fact points to the desirability of killing venereal organisms whilst they are still on the

surface when they have penetrated into the glands and deeper layers they are inaccessible

All statistics on the subject of venereal prophylaxis agree in showing that the longer the interval between infection and disinfection the greater is the incidence of venereal disease For this reason complicated systems of disinfection requiring skilled assistance are bound to fail as they cannot be applied at once. Even calomel cream is frequently applied insufficiently, the man being content with smearing himself perfunctorily and omitting the prolonged rubbing which is essential to bring the disinfectant in contact with the organisms

The hard mercuric soap experimented with seems to have numerous advantages over any substance hitherto recommended for personal prophylaxis It can be carried in a small pocket and gives rise to no suspicion of the purpose for which it is intended, it has been found by experiment, to be unirritating when rubbed into the penis for a long time it can be used repeatedly, a man cannot do himself any injury with it even if he swallows it he will vomit it up again In order to apply it the man must rub the part thoroughly it is easy to apply and even a drunken man could still wash himself when he might be incapable of rubbing in an ointment thoroughly

When made into a lather this soap is able to kill *B prodigiosus* in the interstices of a piece of chamois leather within five minutes its potency is unaffected by the hardness of the water and if water is not available it will make a good lather with urine the mercury in the soap does not have any effect on a gold ring worn on the hand whilst using it

One great disadvantage of calomel cream is that some prostitutes object to it and ridicule men for using it Washing with an apparently ordinary soap is not so likely to excite their derision

Many authorities have advocated washing with ordinary soap or soft soap It has been shown that these substances have little or no germicidal action, although they are no doubt useful mechanically A powerful germicidal soap is obviously better, and is also more likely to be used thoroughly because of the greater confidence it inspires, even as the waters of Jordan on a certain occasion were found to be more effective than those of Abana and Pharpar rivers of Damascus

It may be said that the soap cannot be injected into the urethra and, if it were would be irritating on the other hand the injection of weak disinfectants such as 1 in 2 000 permanganate or calomel cream, seems to be positively dangerous by carrying up gonococci which they may not succeed in killing

Potassium permanganate particularly seems to have many disadvantages, if given to man in the solid state they are likely to make it up too strong or dissolve it imperfectly, causing burns Solutions of 1 in 2,000 or 1 in 2 500 such as are usually recommended have been shown above to have no effect on *B prodigiosus* in chamois leather, and

such solutions rapidly lose such disinfectant properties as they have if kept in a bottle with a cork and are instantly inactivated by urine

The mercury soft soap was found to irritate the penis if applied undiluted and is therefore unsuitable as a prophylactic

No definite conclusions can be drawn from the growth of staphylococci in many of the culture tubes, as these organisms may have been rubbed into the chamois leather either during the disinfecting process or during the subsequent rinsing The organism is however, known to have a higher resistance against disinfectants than most other sporeless organisms, and this no doubt accounts for the failure of calomel cream to kill them even after forty eight hours of inhibition in one of the experiments

It is fully realized that these experiments are insufficient to form the basis for dogmatic statements, but the following conclusions appear to be justified —

## Conclusions

(1) Calomel cream is a weak disinfectant which fails to kill *B prodigiosus* in five minutes under conditions somewhat resembling those usually obtaining when it is applied for prophylaxis

(2) Calomel cream will inhibit the growth of organisms and will kill them after prolonged treatment

(3) The disinfectant action of calomel cream is due chiefly to the calomel and partly to the lanoline base

(4) Potassium permanganate 1 in 2 000 is too weak to kill *B prodigiosus* under similar conditions It is so weak and so easily decomposed as to be very unsatisfactory as a prophylactic

(5) Ordinary hard and soft soaps have a negligible disinfectant action, although, possibly they remove organisms mechanically

(6) A certain proprietary mercuric iodide soap is theoretically a far better prophylactic than any of the above, combining all the advantages of a soap with powerful disinfectant properties

I have to thank Mr R C Frederick Demonstrator in Hygiene at the Naval Medical School, Greenwich for the analysis of Me Ce Fa and for his advice on the chemistry of some of the disinfectants investigated

*Note* —It has been thought best not to mention the exact name of the mercuric iodide soap dealt with above Any person wishing to investigate its properties further may have full details on application to the writer at the Royal Naval College, Greenwich S E 10

# Naval Medical History of the War.

## SURGICAL SECTION (*continued*)

[illegible] SURGEON [illegible] AMBULANCE [illegible] WILDEY C.B., [illegible]

## PART III.—REGIONAL SURGERY (*continued*)

### G. AMPUTATIONS AND ORTHOPAEDIC SURGERY [illegible]

By Fleming Sims, [illegible] A. E. McAllister, M.B. [illegible]

### THE THEORY OF AMPUTATION (*continued*)

(*Continued from p. 291 of [illegible]*)

#### Amputations in the Leg

Section of the bones in the middle third of the leg gives the most satisfactory results of all amputations where the bones are sound. Some textbooks recommend amputations in the lower third of the leg on the assumption that the longer the stump the better. Experience proves this to be wrong. In this region the bone surface is small and consequently very little weight can be borne upon it, and the extremity of a medical advantage in respect. Average that a stump of this length has never run in the middle third is neglible. The circulation in the lower third is exceedingly poor and the stump in consequence is [illegible] all the causes disorder of the patient. Lastly, the end of the stump in this position is so close to the surface that through friction against the border of the neighbouring leg an inflammatory always forms in this region. On the other hand at the middle third of the leg the bone surface is large, the end of the stump is well and fat and consequently much weight can be borne on it. The length of such a stump is more than enough to protect the limb with [illegible] and comfort. Thus it has been the general [illegible] has been impossible to [illegible] Syme to amputate in the middle third never in the lower third unless as a preliminary to a subsequent operation. In amputations in the middle third subsequent [illegible] when two precautions have been taken: (1) to saw the [illegible] of the tibia and (2) to saw the fibula at least half an inch higher than the tibia. Unless this latter precaution has been taken the lower end of the fibula has been found to [illegible] frequently protruded into the parts of the stump in painfully tender.

#### Amputation in the Shaft of the Femur

This operation must be condemned. In it the bone is sawn a hand breadth below the patella and it follows that the length of the stump

[illegible] joint. Until the stump is [illegible] below the [illegible] joint is [illegible] the patient can [illegible] which will give him the [illegible] artificial knee joint.

## Disarticulation of the Knee-Joint

This [illegible] must be considered [illegible] for although it is [illegible] the end of the stump is [illegible] the artificial limb will have the same defect in the [illegible] joint and [illegible] the leg has not been [illegible] the thigh bucket has to be [illegible] it follows that the [illegible] will [illegible] the level of the natural patella when in the sitting position. When this disarticulation is done however it is well to [illegible] the patella for it is now no use and if left is a source of annoyance to the limb maker and also to the patient by virtue of its mobility. The patella should only be left when a Stephen Smith amputation has been [illegible] in a septic case and the flaps have been left open for it can be [illegible] in a Stokes Gritti amputation.

## Amputations through the Thigh

The ideal stump is obtained by a transcondylar amputation if the bone is sawn through the upper portion of the condyles of the femur, and the cut is placed well above and behind the saw cut. The elaborate Stokes Gritti operation when the articulating surface of the patella is sawn off, and the remaining portion of the patella is pegged to the cut surface of the femur gives the best results for the stump is capable of bearing the whole weight of the body. This operation should always be done if possible, for even if the patella becomes loose again it can easily be removed and the end bearing capabilities of the stump are very little impaired. In all thigh amputations the adductor muscles should be drawn down and stitched to the periosteum otherwise they will contract upwards and form a bulging mass in the inner side of the thigh. This is very uncomfortable in the limb and the effect is worse still if the muscles bulge out above the upper end of the bucket. As regards shorter amputations of the thigh, there will often be difficulty in retaining the stump in the bucket if the artificial leg, especially if the stump is a fat one. In such cases a pelvic band has to be fitted to the bucket. This apparatus is somewhat like a truss, and fits round the body at the level of the anterior superior iliac spines and is fixed on the outer side of the limb by a metal upright with a screw hinge at the level of the tip of the great trochanter. Its function is to prevent the limb from swinging off the stump when the patient walks. Even when half the femur remains and the stump is a fat one a pelvic band may be necessary. Very short thigh stumps are a difficult problem. Unless the remaining portion of femur is 3 to 4 in. long below the lesser trochanter the stump is generally useless for it is too short to propel

an ordinary thi[illegible] for the [illegible] hip amputations [illegible] short stump [illegible] flexed, and [illegible] impossible [illegible] them. Therefore [illegible] femur [illegible] can be saved it [illegible] disarticulate the [illegible] joint than to leave [illegible] however a man [illegible] short stump [illegible] disarticulation [illegible] similar to that for [illegible] sits down int[illegible] the [illegible] with the [illegible] through a hole in [illegible] the bucket. [illegible] limbs cannot [illegible]

## Disarticulation at the Hip Joint

There are two [illegible] operations in this [illegible] a racket incision. [illegible] has given excellent [illegible] has been taken to make flaps in [illegible] than is just [illegible] the pelvis otherwise a short fleshy stump [illegible] hindrance [illegible]


Fig. [illegible] To illustrate the flaps [illegible] to disarticulation at the hip [illegible] suture. A B [illegible] flap B C D to [illegible] sutured. Compare at B [illegible] removed as the suture [illegible] from the flap D E [illegible]

the limb maker. (2) The [illegible] Jordan amputation. The [illegible] should never be done unless [illegible] circumstances, for after it a patient cannot wear a modern artificial limb. It leaves a stump nearly half the length of the thigh from which the limb has been filleted. Such a stump is useless for a thigh bucket and it is so bulky to be packed into a leg limb [illegible]

Referring back to the amputation by a [illegible] for the best results have been obtained when the operation has been practised through an incision first introduced by Captain C M Hugg[illegible] R A M C, especially when a short stump has had to be refashioned It would be well to quote his description He says I make my incision leaving as much skin as possible on the inner and posterior surfaces [illegible] before suturing I pull this posterointernal flap firmly outwards and forwards and remove all redundant skin with scissors It is absolutely imperative that there should be no redundant muscle or skin in hip-joint amputation The pre-mammillary incision is just below Poupart's ligament over the femoral vessels about 2 in long The femoral vessels are divided between ligatures The incision is then carried inwards for a short distance parallel to Poupart's ligament and just before reaching the adductor tendon it is carried down [illegible] and slightly backwards to a point 3 in below the fold of the groin [illegible] across the posterior surface of the leg and on approaching the [illegible] the incision is carried up to cross the middle of the great [illegible] and then on to join the commencement of the lateral incision [illegible] skin and subcutaneous tissues are then dissected as far as possible up the stump The muscles are then divided in turn those in front and on the inner side as close to their origin as possible The head of the femur is then disarticulated in the usual manner

## AMPUTATIONS OF THE UPPER EXTREMITY

Fortunately these have been less common than those of the lower extremity and a patient who has lost one arm rarely misses it after a few months for his hands with perseverance he can do with one hand almost everything where he previously employed both Nevertheless while an artificial arm is of great assistance to him he is not so well off as a man who has lost a leg for the movements of a hand and arm are more highly specialized than those of the leg and it is impossible to reproduce them with precision in a mechanical apparatus It follows from this that every portion of the fingers that can be saved is important Even in those cases where the patient had only the first phalanx of the thumb left to him what remained was found to be of more value than an artificial hand, for it is possible to fit artificial fingers in a glove to the hand stump, and to [illegible] the stump of the thumb could be approximated In the same way the stump of one finger only is valuable The moral therefore is, save any portion of the fingers possible below the metacarpo phalangeal joints [illegible] were sometimes seen where the thumb and fingers had been lost *toto* In these amputation above the wrist joint was performed unless the patient was willing to wait until experimental work of the future could show whether the movements of the wrist joint could be employed in controlling the movements of artificial fingers

All the textbook amputations of the fingers are good No improvements have been made on them Amputations through the carpus gave poor

[illegible] the [illegible] are most difficult to fit [illegible] is those resulting [illegible]

### [illegible] AT THE W[illegible]

This operation should never be done [illegible] amputation, the stump has to be considered [illegible] stump and the limb has to be fitted over all [illegible] be at a lower level than the natural one [illegible] this owing to the lower end of the stump [illegible] part of the forearm in bracket of the [illegible] instead of one of the next ones for the [illegible] sometimes apt to make the patient discard [illegible] lower ends of the radius and ulna form a very [illegible] this the lower end of the stump is very apt to [illegible] A further disadvantage in such a stump exists in the fact that [illegible] ulnar joint is very liable to become ankylosed and [illegible] and supination is lost

### AMPUTATIONS THROUGH THE [illegible]

If the hand must be sacrificed the best [illegible] above the wrist joint [illegible] stump) is obtained most of the pronation [illegible] the movements of pronation and supination [illegible] some of the artificial arms are trained [illegible] gradually less as we go higher up the forearm and in the middle third pronation is almost absent. But the stump is still useful for all limbs and is ideal when the arm to be worn is [illegible] the mechanical varieties where pronation and supination of the hand are carried out by the mechanism of the arm and the stump is not [illegible] to interfere with this mechanism. Great care must be taken in amputating through the upper third of the forearm lest unless [illegible] of the ulna are left the stump is useless, for it cannot be retained in the bracket of the artificial arm and if the stump is at all muscular in [illegible] than this will be required. When these short stumps are flexed to a right angle the remaining portions of the forearm muscles [illegible] and push the bracket off the stump. Fitting is therefore very difficult and so it must be remembered that every portion of the ulna should be saved within the above mentioned limits. If a very short stump is considered, it will be seen that when flexed to a right angle its lower end is roughly in the same plane as the anterior surface of the upper arm and as the stump below the elbow is useless the whole must be considered more or less as though it were a long upper arm amputation and the bracket fitted over all. The elbow of the artificial arm is therefore lower than the natural one and the patient is not pleased with the result, and the functional power of such a

[illegible] if as good as it is [illegible] upper arm amputation. The [illegible] of the femur is in fixing [illegible] above the elbow joint [illegible] than [illegible] of ulna cannot [illegible] before sacrificing the joint [illegible] must be fully [illegible] for he may be [illegible] improbable that [illegible] which can [illegible] stumps and this [illegible] of the natural elbow [illegible] last 20 per cent to the [illegible] of the artificial arm.

## Insertion of the Artificial Joint

What has just been said applies with equal force [illegible] for the stump left by the [illegible] should never be [illegible] higher up. Yet [illegible] when this [illegible] deliberately [illegible] the impression that [illegible] the stump the better. The result [illegible] is to be lower than the natural [illegible] account of the [illegible] the stump being broader than [illegible] supplied. This is a constant [illegible] the patient and [illegible] discards the arm altogether.

## Artificial Arm

The ideal place for [illegible] of the [illegible] is in its lower third and this should always be [illegible] the elbow joint or in patients [illegible] As there is little [illegible] any form of amputation [illegible] good results.

The best results [illegible] of skin and subcutaneous [illegible] is useless at the end of such a stump but [illegible] on the nerves. The muscles of the [illegible] should be [illegible] the stump level or there results [illegible] of the bone. The flap may be [illegible] wherever the [illegible] of the possible [illegible] anterior and posterior flaps [illegible] itself should be [illegible] A right short arm stump such as this is more [illegible] will [illegible] fold the [illegible] extremely painful and the [illegible] possible should be [illegible] the flap have to be short [illegible] contract and the wound [illegible] granulation. Should the stump be only 1 in. long below the margin of the pectoralis major [illegible] for an upper arm bucket can scarcely be held on at all [illegible] Such a stump should be disarticulated at the shoulder joint for [illegible] arm suitable for this amputation though cumbersome is [illegible] on which can scarcely be held on at all.

[illegible]

[illegible] piece [illegible] the cup [illegible] upper and [illegible] found [illegible] the removal [illegible] comprising what [illegible] can be [illegible] of such an [illegible] by means of straps and [illegible] the patient still [illegible] flexion [illegible] of the elbow is possible and [illegible] permanent substitute a hook for the hand when occasion arises [illegible] is heavy [illegible] as with [illegible] hand. Then when the [illegible] patient has been removed this type of arm can be fitted. Then [illegible] the surgeon [illegible] hesitate [illegible] useless piece of humerus. [illegible] that disarticulation at the shoulder joint [illegible] than that [illegible] sawing the bone through the [illegible] but the former should always be done in preference [illegible] some arm makers prefer the rounded shape [illegible] the presence of the head of the humerus the majority prefer the [illegible] suited by the simple common process and should [illegible] the leather shoulder cap can be fitted with greater accuracy and [illegible] to the hollows formed by these prominences. The [illegible] should [illegible] naturally makes an [illegible] of the high bone [illegible] this [illegible] is not nearly so marked when the bone [illegible] is [illegible] the head of the humerus [illegible] On the other hand [illegible] the head of the humerus [illegible] the [illegible] and this is an important consideration of the patient only [illegible] for short periods.

## PART II

## MODIFICATIONS RENDERED NECESSARY BY WAR TIME CONDITIONS

HAVING considered the theory of amputations [illegible] it remains now to relate some of the many [illegible] had to be varied [illegible] the [illegible] presence of frost-bite or the advent of sepsis [illegible] upon a gunshot wound. It must be [illegible] that an ideal stump can eventually be obtained in all cases and it is important that the steps taken to obtain this end should be as few as possible. Patients who have suffered from gas gangrene have operations [illegible] the early part of this paper that re-amputation is [illegible] necessary. This is for two reasons. Firstly in the early days of the war surgeons were attempting too much in the primary amputations of wounded limbs [illegible] sepsis persisted or developed complete failure resulted and extensive re-amputations had to be performed. Secondly with experience it was found

[illegible] The [illegible] [illegible] [illegible]

[illegible] stump is sufficiently long [illegible] natural joint above but [illegible] stump [illegible] long enough to carry a limb and [illegible] that the stump may be useless. It may even be a burden. The only remedy left then is to amputate above the next joint. This can be avoided in almost all cases except those of gas gangrene by saving all healthy skin at the primary operation. In gas gangrene it is important to remove the limb quickly above the level of obvious sepsis but in [illegible] large wounds with compound fracture it is indeed rare to find [illegible] skin on the opposite aspect of the limb cannot be saved. This [illegible] maintained as a flap and eventually when sepsis has subsided it can be drawn across the end of the stump and sewn into position. [illegible] the diagram (fig. 3) will make these points clear.

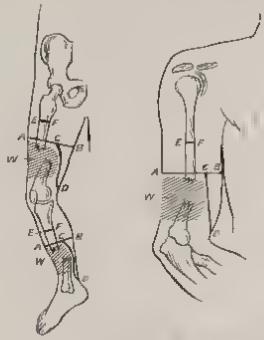



Fig. 3.—To illustrate [illegible] when salvage. The [illegible] the same lettering [illegible]

W represents a large open wound with compound fracture. Amputation has been decided upon. The line A—B represents the incision and position of bone section in the guillotine operation. The line E—F shows the position where the bones will be sawn in the subsequent amputation by the flap method. Now had a partial guillotine from A to C been performed and the skin flap represented by C—B—D been saved, this flap could later be trimmed and sewn across the end of the stump uniting the

kin [illegible] represented by A [illegible] The question [illegible] must [illegible] with the ut[illegible] It must be [illegible] that whilst the [illegible] wound is [illegible] the [illegible] represented by C [illegible] D in the diagram [illegible] the patient [illegible] off [illegible] had been performed [illegible] By [illegible] it will be seen that in the [illegible] amputation the [illegible] lines F—J and A—C will have to be sacrificed and in [illegible] cases of the leg the resulting stump will be [illegible] that of the [illegible]

Again in the lower third of the leg the [illegible] may [illegible] of sufficient length of stump [illegible] as shown [illegible] should be to do a flap amputation [illegible] conditions are favourable. On the other hand when the [illegible] approaches the seat of election [illegible] amputation must never be performed [illegible] it cannot be [illegible] will [illegible] The leg will then probably [illegible] and the chance of obtaining a [illegible] stump [illegible] first [illegible] gunshot wound of the foot [illegible] anticipated it is best to remove the affected part [illegible] through the [illegible] and later to convert [illegible] It has been stated in the first part of this paper that [illegible] the elbow wrist and knee joints should [illegible] cases when the wound is left open and then only [illegible] amputation higher up. It follows therefore [illegible] be employed in these regions and [illegible] below [illegible] for there will be ample above it to [illegible] flap [illegible] when sepsis has subsided.

The opportunity of following the history of sailors and marines from the time they received their wounds to the time when they were fitted with their artificial limbs shows that these cases may be divided into [illegible] groups. The lessons learnt as regards treatment may be briefly stated thus:

(1) *Those cases in which [illegible] part of the limb has been carried away by a [illegible] fragment.*

Should such a case occur on board ship the surgeon might be tempted to do a flap amputation immediately thinking that [illegible] sepsis would not be likely to occur. Such a procedure will lead to disappointment for suppuration will almost certainly arise, the flaps will need to be opened up again, re-amputation will probably be necessary and the stump may lose much of its usefulness. As little as possible should be done at this time. The blood vessels should be tied with catgut and any nerves that can be found cut short. Ragged points of bone should

be sawn off. Finally the wound should be thoroughly washed with Lister's strong mixture (1 in 20 carbolic acid, 1 in 1000 perchloride of mercury) and a double iodoform gauze dressing applied. The use of this lotion should not be started in these cases.

The antiseptic dressings should be changed regularly, and when conditions are favourable refashioning of the stump can be undertaken with every hope of success.

(2) *Those cases where there is a large wound associated with compound fracture, and amputation is obviously necessary.*

Here the upper fragment of bone must be trimmed and the limb taken off at that level, care being taken to save all sound skin below, for it may be invaluable later as a flap (*vide* fig. 4). The wound thus made must be left open and treated as in the first type of case.

(3) *Those cases in which amputation is decided upon after the Base Hospital.*

These are generally cases of small wounds with or without compound fracture where severe sepsis has supervened, and perhaps gas gangrene, and so amputation is urgent in order to save the patient's life. In these the guillotine method is employed because of its speed, for the patient is in an unfit state to stand a long operation. The incision should be made just above the obviously infected tissues, and the wound left open for free draining. Weight extension is applied to the skin, whilst healing by granulation takes place. An ideal amputation is performed later if necessary.

(4) *Those cases in which amputation has already been performed, healing has occurred, and still the stump is unfit for an artificial limb.*

Under this heading the question of re-amputation has to be considered, that is to say, in cases where the stump is either too short or the guillotine scar is unsatisfactory. The great difficulty in these cases is to decide when it is safe to open up the stump again. The risk that is run is that of starting suppuration all over again. The original wound was teeming with pyogenic organisms which during the process of granulation have been shut off in thousands of minute pockets, and at any subsequent operation many of these pockets are opened, and general infection of the wound results. This state of affairs is frequently seen when the first amputation was performed as long even as twelve months previously.

As a general rule, however, when superficial and deep oedema have been absent from the stump for three or four months it may be considered safe to operate, but the surgeon must be prepared for disappointment. Before any re-amputation is undertaken the stump must be massaged for at least a month in order to improve the natural elasticity of the skin which is going to form the new flaps. The flaps are cut according to the skin available, for it does not greatly matter where the resulting scar is so long as it does not suffer pressure at the end of the bone. A cuff of periosteum should always be made in these cases, as it will prevent exostoses growing from the end of the bone. This is a matter of some importance as these bony outgrowths frequently cause extreme pain.

[illegible] level of the lower third of the thigh [illegible] Hitherto there should be no hesitation in [illegible] the amputation has been done through the middle third [illegible] shortening must be carried out with the greatest [illegible] stump may be either too short or at best barely [illegible] unless 3 in. of the ulna are left, the stump [illegible] it is an impediment. In thick arms even when 4 [illegible] it is difficult to fit an artificial arm which will stay [illegible] for the reasons stated in the first part of this [illegible]

[illegible] Gigli saw successfully overcomes this difficulty by [illegible] of muscles through longitudinal incisions but [illegible] little avail when less than 3 in. of ulna remain. Under [illegible] re-amputation has to be performed 2 in. above the [illegible] limb can be fitted satisfactorily.

[illegible] if the humerus similar difficulties arise. There must [illegible] humerus left and in cases of short guillotine stumps [illegible] that the suture is liable to so little pressure it is [illegible] Cases frequently arise where less than 2 in. of [illegible] beyond the anterior axillary fold and an artificial arm [illegible] if a natural shoulder joint cannot be won.

[illegible] inch in length of humerus can be gained by an operation [illegible] practised by Mr. Muirhead Little. He detaches the lower [illegible] insertion of the pectoralis major, folds it back and sutures it [illegible] portion. Fully an inch of bone can be reclaimed in this way. [illegible] procedure fail and the patient declines to have a disarticulation [illegible] shoulder the only alternative is a shoulder flap with the [illegible]

In [illegible] extremity the question of shortening is of even greater [illegible] it is in the case of guillotine scars and linear scars which have [illegible] transit great trouble. Refashioning of the stump in the [illegible] is always inevitable. A lower third of the thigh stump may [illegible] but sparingly so. It is in the middle third or [illegible] exercised for as stated in the first part of the [illegible] fully half an inch of femur are saved below the lesser trochanter the stump will be too short for a thigh bucket and too long for a hip bucket. Cases are seen where the guillotine has been performed in the upper third of a thigh. Here the resulting scar is the worst of all and the stump is generally flexed abducted and useless. It is not worth while attempting a flap amputation in these cases. A disarticulation at the hip joint must be performed for experience shows that men with hip joint amputations walk just as well as many of the thigh cases and better than those with unsatisfactory thigh stumps. Below the knee may unsatisfactory stumps may be shortened providing that the resulting stump is at least 2 in. long, below the inner popliteal fold when the knee joint is flexed.

If this cut [illegible] It is advisable [illegible] tation [illegible] the guillotine amputation [illegible] been performed at the seat [illegible] These stumps are hopeless The knee joint is nearly always [illegible] and the scar breaks down under the least provocation [illegible] ment is to convert these into a Stokes-Gritti supra condylar [illegible]

Sometimes [illegible] where a good flap operation has been performed at [illegible] if flection and yet the stump cannot be retained in a flap bracket when the knee joint flexes These can often be improved by removing the remaining portions of the fibula The girth of the stump is thus reduced and the difficulty in fitting a limb is thereby often overcome Should this manœuvre fail the patient must be supplied with a kneeling leg which is unsightly or else submit to a supra condylar amputation such as the Stokes-Gritti

The last type of re amputation case as regards the lower extremity includes those cases where a Chopart or Lisfranc has been performed for frostbite of the toes or wounds of the fore part of the foot What has been said earlier concerning the deformity which arises in Chopart stumps applies with much greater force here The tripes frequently becomes extreme and the patient walks on the end of his stump In frostbite the nutrition of the flaps is so poor that they generally breakdown and a large scar results A guillotine scar in this region is also bad It is hopeless for the patient to be compelled to walk on the scar and the fitting of a satisfactory boot is impossible The only treatment is to convert such a case into an extended Syme even when the condition is bilateral

## AFTER TREATMENT OF STUMPS

The general surgical principles which govern the treatment of any operation wound should be carried out The sutured skin edges should be supported by rubber strappings and this support should be maintained for a week after the stitches have been removed in the tenth day The drainage tube which should be inserted in the angle of all wounds may be removed as soon as the drainage has ceased When the stump is no longer painful massage must be commenced in order to reduce the girth of the stump and to increase the natural elasticity of the skin Active and passive movements of all joints above the wound must be insisted upon after the third day

After the daily massage the stump should be thoroughly cleaned with methylated spirit diluted three times and then well powdered A tight webbing bandage should be worn during the daytime

This grooming of the stump must be carried on indefinitely even after the artificial limb has been supplied Indiscriminate use of splints must be avoided and arm stumps should not be put in a sling The non-observance of these two points will result in obstinate stiffness of the joints

[illegible] it is found that the stump [illegible] everything [illegible] this. Massage [illegible] share [illegible] markedly [illegible] and for a week the stump [illegible] it [illegible] is unnecessary.

[illegible] should not [illegible] months have [illegible] amputation. [illegible] (vide infra). [illegible] induce [illegible]

## PART III

### THE ACCIDENTS OF AMPUTATION STUMPS

MANY conditions arise which prevent the [illegible] limb when this has been fitted suspend its use [illegible] perfect in all other respects. It would [illegible] accidents seriatim.

*General Sepsis of the Stump.*—This condition [illegible] signs and symptoms and is characterized by [illegible] of the end of the stump accompanied by high temperature [illegible] for the absence of any discernible abscess formation. The final amputation has probably been performed through tissues which appeared to be healthy but which nevertheless are infected. Although the flaps may heal without suppuration still the infective organisms are lying dormant in hundreds of minute pockets in the tissues of the stump and these may be roused into activity at any time. Should this occur general sepsis of the stump results. The exciting cause of this condition is slight trauma generally resulting from the wearing of an artificial limb or from too vigorous massage. It is much more common in the leg than in the arm. It is ushered in by headache and a feeling of general malaise with a sudden rise of temperature to 103 or 104°. The patient would appear to have a attack of influenza.

Not until the following day are there any local signs in the stump, and then about eighteen hours after the onset an erythema appears over the [illegible] and this rapidly extends and deepens in intensity of colour. The erythema has a well defined but irregular edge and often small islands of erythema appear higher up the stump. Inflamed lymphatics are [illegible] and the glands are often enlarged. In a few hours the [illegible] and deep tissues are found to be indurated. Occasionally small blisters form on the surface and the condition then somewhat resembles erysipelas. The respirations and pulse are markedly increased in rapidity and the stump part is but little painful. The temperature remains high for four or five days and then falls rapidly, often by crisis. About

[illegible] temperature has fallen [illegible]

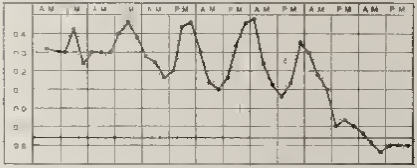
[illegible] stumps of the stump [illegible] eighteen months after the last operation [illegible] trouble of any description has intervened. It would be [illegible] case in illustration.—

A man received a wound in the foot in [illegible] In the following December a guillotine amputation was performed [illegible] third of the leg. Suppose it that time was evidently [illegible] there were healed scars of incisions around the knee joint. In [illegible] 1911, the final flap amputation was performed in [illegible] leg and the flaps healed perfectly. In October of the same year he was supplied with an artificial leg which he wore for about [illegible] first occasion. At noon on the following day he complained [illegible] ache and malaise and his temperature was found to be 101. On the following morning the stump was inflamed and slightly [illegible] painful at that time. There was one small island [illegible] side of the thigh. The temperature remained high until [illegible] the fifth day when it started to fall rapidly. During this time the erythema had increased in intensity of colour and had spread upwards to the patella and surrounded the whole stump. There was no fluctuation anywhere. During the fall of temperature the [illegible] rapidly and the œdema had completely gone when the temperature had been normal for two days. Temperature Chart A shows [illegible] this case and is interesting in several particulars for it differs markedly from a case of abscess of the stump as shown in Chart B. It may be [illegible] typical chart of this condition for it resembles [illegible] chart prepared by plotting the average temperature [illegible] such cases.

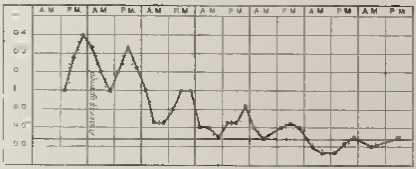
*Treatment.*—At the onset of the condition the patient should be put to bed and be given a smart purge followed by a saline. Laxatives should be given if the bowels are expected to act. Five grains of quinine should be given three times daily until the temperature falls. The affected limb should be placed on a pillow. The whole area of erythema should be painted with iodine mixture 5 gr. to the oz., and fomentations should be applied every two hours. Incisions should never be made into the infected part for pus is never localized in this condition. If incisions are made they will take a long while to heal, they will generally suppurate and there is still later be a source of annoyance in the limb he lives. It is a good plan to allow the patient to wear his limb again as soon as the œdema has gone. Such a procedure generally causes a recurrence of the attack and often several recurrences, but each attack is less severe than the previous one until finally there is no reaction. The wearing of the limb seems to cause the patient to make his own vaccine.

*Abscess Formation.*—Abscesses are commonly found in well healed

stump [illegible] by some [illegible] [illegible] the stump [illegible] [illegible] pressure in the [illegible] the stump [illegible] [illegible] ously and are then [illegible] [illegible] of small sequestra The part [illegible] [illegible] is painful The scar often bulges The [illegible] ment is [illegible] n into the thinnest and most prom n n




Temperature Chart A —General [illegible] of stump




Temperature Chart B —Abscess of stump

[illegible] The pus escapes under pressure and often as much as a [illegible] after only a few hours from the onset Silk ligatures and [illegible] often escape with the pus More than a stab incision is [illegible] sary and through this the abscess cavity should be irrigated [illegible] work antiseptic twice daily It is remarkable how quickly these [illegible] h al after the offending ligature or sequestrum has come t way

Sinuses —Sinuses are always due to the presence of sequestra and silk [illegible] may persist after these have been removed unless the drain [illegible] cavity is adequate Occasionally a sinus may persist after a large [illegible] has been opened and then it is a sure sign that the foreign

[illegible] by [illegible] a probe into the [illegible] sinus [illegible] results [illegible] Sometimes [illegible] gently [illegible] means of a [illegible] probe. These [illegible] often develop in the scar without any active suppuration [illegible] A small fistula appears in the scar and this ruptures [illegible] stagnant serum to escape. A probe introduced into the fistula will [illegible] its whole length within the hanging foreign body. It is [illegible] wise to allow the patient to continue wearing the [illegible] caused by it often promotes expulsion of the foreign [illegible] However a minute sequestrum or silk ligature is [illegible] the rule to the surface. Extraction is then easy but healing [illegible] always occurs afterwards for other ligatures may be causing [illegible] An operation on a sinus should not be undertaken hastily. It is better to wait for a long period extracting loose ligatures whenever [illegible] Often a dozen or more ligatures are removed from a sinus by simple means. On the other hand if the wound be opened up freely the most careful search does not always end with the removal of all foreign material and when the wound heals there will be a sinus persisting. Sometimes a sinus leads to a sequestrum on the opposite aspect of the bone. Removal of such a sequestrum cures the sinus is impossible. It should be carefully [illegible] by x rays and removed by an open operation. The incision should be sewn up with drainage and not allowed to heal by granulation [illegible] the resulting scar may be the cause of the sinus.

*Sequestra.*—Sequestrum formation is the natural result of suppuration in a stump and the extent of the sequestrum depends largely upon the amount of drainage afforded the wound. In guillotine amputation sequestra are small but where flaps have been made and sewn up and suppuration has continued the sequestrum is always large and causes much less trouble. Sequestra not only vary in size but in shape also. The most common perhaps are in the form of specules or small cubes with minute tooth like projections from the surfaces. Others are in the form of a complete ring from the end of the bone but more often they are only a segment of the circle. Frequently a large conical sequestrum is removed. Every stump should be x rayed before a limb is fitted and if a sequestrum is detected however small it must be removed. The smallest sequestrum may cause an immense abscess followed by further sequestrum formation. In removing sequestra by operation it is undesirable to attack them but the sinus of such exists. An incision should be made in the most accessible part and after the sequestrum has been extracted the sinus should be explored and all granulation tissue and fibrous tissue freely removed.

*Bony Spurs.*—The growth of calcareous deposits in the tissues at the end of a stump is another result of suppuration. A mass of new bone forms at the sawn end of the bone and extends into the tissues around and varies much in size and shape. In clean amputations where it has been

possibly [illegible] periosteum, the [illegible] outgrowths of bone do not occur. [illegible] pears to [illegible] the growth of bone. But in [illegible] impossible to employ a periosteal cuff no [illegible] the bone is free to proliferate. We know that [illegible] amount of callus to form around fractures which [illegible] obliterated than is the case where the [illegible] is intact. It would seem that suppuration [illegible] same way. These masses of new bone are [illegible] than on any other bone.

[illegible]

[illegible] any trouble [illegible] mucous [illegible] Spur [illegible] gum [illegible] on the [illegible] The [illegible] such.

An [illegible] when a spur grows out from the main mass [illegible] takes the form of a spike. These calcareous deposits [illegible] unless causing trouble for they

[illegible] Sometimes the [illegible] of the [illegible] particularly when they [illegible] this point much more [illegible] happens [illegible] the vessels. When [illegible] the periosteum should be [illegible] the muscles should be sewn together after the [illegible] with a [illegible] Any nerves in the vicinity [illegible] cut short [illegible] the wound should be [illegible] sewn up.

*Myositis Ossificans.*—This condition when [illegible] stumps is due to an exuberation of the last [illegible] bony mass that assumes enormous proportions, involving the great part of the extremity of the stump.

*Painful Stumps. Nerves.*—This subject must be considered under four headings:—

(1) Nerve endings in scars.
(2) Painful bulbous nerves.
(3) Pain during the course of nerve.
(4) General hyperæsthesia of the stump.

(1) *Nerve endings in Scars.*—There should be [illegible] multiple acutely painful points in the scar. In [illegible] linear scar in a flap amputation for generally all nerves [illegible] stump cases but in gunshot amputations the [illegible] quently painful nerve endings are frequently [illegible] scars. By gentle pressure upon the painful point [illegible] refer the pain to some part of the limb he has lost. [illegible] instance which tingle he thinks is being touched. [illegible] determine which nerve is affected. When it is not [illegible] the amputation into one by flaps it is easy to draw all the [illegible] and to cut them off short, allowing the cut ends to retract upwards. In cases where re-amputation is unnecessary or [illegible] the [illegible] nerves should be attacked in their course. Nerve [illegible] removed from the scars themselves for the [illegible] and the nerve is almost certain to become involved [illegible] upon these nerves caution must be taken in [illegible] incision along the course of the nerve must be made when the resulting scar is not likely to suffer pressure from the limb bucket, and the nerve must be cut sufficiently short to allow its upper cut end to retract well above the upper end of the incision.

(2) *Painful Bulbous Nerves.*—All nerves when cut, develop a small neuroffibroma at the cut end. These bulbs are painful and often acutely so for a varying period after the operation. In clean cases the pain generally subsides in about three weeks but in those where sepsis has caused a proliferation of fibrous tissues, and this has become intermingled

[illegible] four months [illegible] Therefore, if [illegible] the final amputation [illegible] no measure of its painfulness. [illegible] either the bulb must be removed [illegible] the nerve itself or else the nerve [illegible] The former is preferable for [illegible] the same reason.

(3) [illegible] It frequently happens that even when [illegible] through the course of the nerve [illegible] spasm spreading along the [illegible] and care must be taken [illegible] the amount of nerve removed [illegible] of pain in the nerve itself [illegible] to order six to nine [illegible] in that time but [illegible] beyond the painful [illegible] most trouble of this [illegible]

[illegible] all the nerves [illegible] stump. [illegible] the plexuses of [illegible] the [illegible] involved in the [illegible] Sometimes [illegible] irritation of the [illegible] whenever the patient [illegible] of his stump or [illegible] fitting [illegible] will also cause this [illegible] complete [illegible] and the [illegible] both mentally and physically. Treatment [illegible] has been found [illegible] the condition [illegible]

The [illegible] to treat the painful nerves is an important one. [illegible] depends almost entirely upon the positions of [illegible] nerve end in relation to the part of the limb [illegible]

[illegible] In the middle third of the leg the nerves are [illegible] that they rarely cause trouble but in the lower third the [illegible] nerve is so close under the surface that the least stumbling [illegible] cause pain. These should be removed from above the [illegible] the nerve can be [illegible] at a place where it lies deeply. In the upper third of the leg the internal popliteal is but seldom troublesome, but if it is simple section just above the bend of the knee in the popliteal space will be found to be the most suitable operation. On the other hand the external popliteal nerve is frequently

troublesome and as the top of the limb bucket p[illegible] below the head of the fibula the nerve must be cut and shortened ab[illegible] otherwise both the scar and the cut end of the nerve are bo[illegible] friction The best procedure is to sever the nerve above the level of the fibula as it lies behind and internal to the biceps A small incision should be made behind and internal to this tendon By doing the operation in this way, the branch to the outer surface of the knee is left uninjured and so an area of anæsthesia in this position is avoided In the thigh, bulbous nerves on the anterior aspect of the stump may be shortened quite down low as the front of a stump suffers so little pressure from the artificial limb On the posterior aspect of the stump, the sciatic nerve when painful must be removed right up to within 2 or 3 in of the level of the tuberosity for the chances of recurrence of pain are great where this nerve is involved It must be remembered that the sciatic nerve is often in two divisions and if such be the case care must be taken to remove both The small sciatic nerve must be shortened at the same time

Secondly, in the upper extremity Here painful nerves do not present so much difficulty as they do in the lower limb Low down in the forearm the nerves are quite superficial and can easily be found but they should not be shortened here for the new formed bulbs will be so close under the skin The nerves must be traced and severed at a point where they lie deeply In short forearm cases where painful bulbs are present it is advisable to sever the affected nerves above the elbow joint otherwise the scars will be interfered with by the top of the limb bucket Bulbous nerves are perhaps most commonly seen at the end of long upper arm stumps Such bulbs may be removed together with about 1½ in of the nerve there is rarely any need to go higher In short upper arm stumps by far the best results are obtained when the affected nerves are cut through by an incision high up in the axilla, for the resulting scar and nerve stumps are far away from the top of the limb bucket

*Bursa Formation*—Just as adventitious bursæ may occur on any part of the body subjected to pressure so are they seen on amputation stumps They are, however, rarely seen on arm stumps but quite commonly on the thigh and most frequently of all on the leg They are due to pressure at the top of the bucket In leg cases they form below the head of the fibula and over the internal condyle of the tibia and sometimes over the tuberosity of that bone In the thigh they form about 1 in below the fold of the groin on the inner side and also under the tuber ischii This latter one is distinct from the one that is enlarged in the condition known as weavers bottom In appearance adventitious bursæ strongly resemble fibrolipomata in fact it is highly probable that they start as such They seem to be caused by the limb bucket heaping up the subcutaneous tissues They do not always give rise to trouble but when inflamed are often acutely painful Fomentations will relieve the pain

[illegible] is wiser and much sounder surgery to remove these bursæ completely [illegible] so they will be found to shell out in much the same way as a [illegible] does and they will be seen to consist of a mass of fat contain[illegible] large proportion of fibrous tissue There is a cavity filled with serum [illegible] interior Microscopically they often show giant cell formation in [illegible] lining membranes of the cavities

*Eczema of the Stump* —Eczema is frequently seen where a scar lies at the bottom of a deep furrow formed by redundant flaps It is also seen at the bottom of crevices in the skin formed as the result of contraction of the deep tissues where the stump has been septic It is also seen around [illegible] especially when these are in scars at the bottom of such furrows [illegible] crevices This condition is due to irritation of non evaporated sweat [illegible] contaminated with micro organisms The difficulty the patient has in [illegible] these furrows clean and dry is also a factor in etiology In almost [illegible] cases if eczema the stump will need refashioning, but it is not safe to [illegible] until the eczema has cleared up The first thing to do is to remove the cause of a sinus if one exists The skin condition may be attacked by any of the mercurial ointments, or better by x rays Silver nitrate [illegible] to the ounce is useful When the eruption has subsided the part must be washed twice daily, followed by the application of dilute iodified spirit A starch and calomel powder is then dusted on Later the end of the stump should be refashioned, removing all redundant skin so as to bring the final scar close to the surface When this is done the eczema will not recur

*Fixation of Joints* —This may be complete or partial

*Complete Fixation* —This condition is due to bony ankylosis following either a septic arthritis of metastatic origin or else a gunshot wound of the joint over and above the wound which has made amputation necessary When the stump is in good position nothing need be done as a rule but it happens more commonly that the stump becomes fixed in a position which renders wearing of an artificial limb impossible Particularly is this the case where the hip joint is concerned Should such an event happen in a thigh amputation the best treatment is to perform a subtrochanteric osteotomy, for when union subsequently occurs in a good position the limb which can then be fitted takes the weight of the body on the tuber ischii, and the gait is good A similar leg can be worn when the amputation is below the knee and ankylosis of the hip has had to be remedied When the knee-joint has become ankylosed in bad position an arthroplasty gives a useless result a supracondylar amputation should be performed in such cases Ankylosed shoulder joints should never be excised for flail stumps always result, and these are useless in controlling the movements of artificial arms If deformities exist they should be corrected by osteotomy at the neck of the humerus In forearm cases where the elbow joint is fixed the joint should always be excised for the artificial arm has a corset which fits round the upper arm and this effectually controls the movements of the

newly-made ankylosis where the elbow joint has been extended the arm should be put up in a plaster splint in a flexed position for two months. This allows the biceps muscles to shorten a little and thus they gain more power. In this way the flexed arm so commonly seen is prevented.

*Partial Fixation.*—Limitation is due to contraction of the extra-articular structures and to the adhesions of the joint and its movements are limited. These deformities result from careless application of splints and from the fact that all joints must be moved daily as soon as all pain has left the stump. It would be well to consider these deformities separately.

*Hip joint.*—This is the joint most frequently injured of all and the thigh stump becomes flexed and adducted. This deformity usually results from the stump having been nursed on a pillow instead of between sand bags. In short stumps the amount of flexion may be extreme. In about 90 per cent. of thigh stumps flexion is present and if the amount does not exceed 10 degrees there is rarely any need for treatment. Wearing the artificial limb will generally cure the flexion. When over 10 degrees of flexion is present and a limb is worn the patient walks with a lordosis which varies in degree according to the amount of flexion. It is in such cases that active treatment must be undertaken at once.

*Method of Estimating Flexion.*—Flexion must not be estimated in a haphazard manner; there is only one way in which it can be gauged accurately. The patient is placed on his back on a firm bench and the sound knee is drawn up to the chin and held there by the patient. The thigh stump is allowed to flex up at the same time until the whole of the vertebral column is touching the table. The stump is now extended and the point at which lordosis of lumbar spine appears shows the amount of flexion present. This should be measured by calipers and records kept during treatment.

*Treatment.*—In recent cases of flexion of the hip joint the deformity is readily overcome by daily massage and passive movements. The muscles of the stump are first firmly massaged. The patient is then placed on a table face downwards, the buttocks are held down with one hand and the stump is forcibly extended and rotated with the other hand. Such treatment for a few weeks will generally suffice to break down all adhesions. In obstinate cases, and in cases of longer standing, operative treatment will be found necessary. This may be carried out subcutaneously or by an open method. The subcutaneous operation is carried out as follows: Under an anæsthetic a tenotomy knife is inserted just below the iliac spine and the tensor vaginæ femoris is cut through. The stump is then forcibly extended, and if considerable force fails to overcome the resistance the knife is re-inserted and all resisting tissues are severed. If this procedure fails, an open operation must be performed. This is best done through an

[illegible]

*h* [illegible] and this [illegible] in all [illegible] in long stumps but [illegible] particularly in [illegible] an exception [illegible] is most [illegible]

*i* [illegible] first case [illegible] then by [illegible] rectified

[illegible] of the tendo achillis frequently [illegible] and the foot and talipes results. Tenotomy [illegible] results which are not gratifying, for [illegible] this operation should only be performed [illegible] patient. A poor foot stump should always [illegible] as already advised.

*j* [illegible] is the deformity seen [illegible] it occurs in cases where [illegible] the limb. It results from the [illegible] axilla. The condition [illegible] subject and in most cases [illegible] movements. A pad [illegible] each day. In more [illegible] cosmetic is all that is [illegible]

[illegible] common deformity here [illegible] Forearm amputations [illegible] will not then occur [illegible] disability or one [illegible] movement under an [illegible] which can be gradually [illegible] practically inability to [illegible] the stump is short and [illegible] stumps. This can be [illegible] the stump.

*Crutch Palsy.*—No description of the ailments of amputation stumps would be complete without a brief note on crutch palsy. This troublesome complaint is due not to pressure of the crutch in the axilla but to compression of the nerve trunks of the arm between the head of the crutch and the inner surface of the upper part of the shaft of the humerus. All the nerves of the arm are involved. The musculo spiral nerve is never alone affected, as is commonly thought for the ulnar nerve is always the first one to show signs of paralysis and then the median and musculo spiral together or separately. The signs and symptoms always take the same sequence. First of all a tingling sensation is felt in the hand and forearm and then weakness of the grip of the hand is noticed. At this stage wasting of the muscles of the first interosseous space appears, followed by a similar condition of the other interosseous muscles. Soon weakness of the forearm muscles is complained of and next the wrist drop appears followed by wasting of the forearm muscles. When taken early the case should not go beyond the stage of ulnar paralysis.

*Treatment.*—The condition can always be prevented by the non use of the old-fashioned crutches. Short crutches with rings at the top for the arms to pass through should be supplied to all amputation cases. Since the introduction of temporary cone legs and pylons the number of cases of crutch palsy has greatly diminished. When the condition has once started the use of the crutches must be forbidden. However early the case, the arm must be placed on a cock up splint with the hand hyperextended and the splint reaching beyond the tips of the fingers. Daily massage should be instituted and electrical treatment given wherever there is much wasting of the muscles. This is not necessary in early cases, for these seem to get well just as quickly on a splint only as they do when the splint is combined with massage and electricity. Finally, whilst on the subject of crutches it ought be well to mention the toilet of the axilla. Unless the axillæ are kept scrupulously clean by the frequent application of a spirit lotion followed by a dusting powder infection of the hair follicles is bound to occur. This gives rise to multiple abscesses and the condition may become extremely severe.

## PART IV.

## LIMB PROSTHESES.

Limb prostheses, good as they are at present, are still in their infancy, but such progress has been made in their mechanism during the past five years that it is probable in the near future arms and legs will have been invented which will meet the requirements of all amputations as they are presented, so doing away with much of the necessity of altering the stump to meet the requirements of the limbmakers. This end is particularly desirable in the case of short stumps below the elbow joint, for in almost

[illegible] such [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] and a jan[illegible]

There are at present a great [illegible] different limbs on the market They vary as regards material and [illegible] in details of mechanism but the general principles of contour and construction are the same in all cases, and they all aim at reproducing the shape and function of the limb as far as possible The shape can always be reproduced, but the degree of function must of course vary according to the position of the amputation The hand movements being so much more highly specialized than those of the foot it follows that the movements of the hand cannot be supplied in *toto*, whereas a man with an artificial leg may be able to walk without a limp Before supplying naval officers and men with artificial limbs, the first care has been to determine their future occupation and to give them the make of limb most suitable for that occupation Further as far as has been possible they have been given the choice of the limb they are to wear

According to the manufacturer artificial limbs are made of wood leather or aluminium, or some proprietary material There is no definite opinion yet as to which material is the best naturally much depends upon the future employment of the patient and on the climate in which he will reside For all general purposes wood is perhaps the most satisfactory material, its chief disadvantage being its weight, and in hot climates it demands a deal of attention to protect it from white ants and wood lice The English willow is the variety chiefly employed for it is extremely pliable, shows no great tendency to crack, and does not undergo any changes in shape owing to moisture Leather is largely employed in the manufacture of arms as it is much lighter than wood On the other hand leather is unsatisfactory for legs, as it is apt to crumple and lose its shape Aluminium gives an extraordinarily light limb—in fact, a thigh leg need not weigh more than 4½ lb but it is very expensive and is not sufficiently durable for a man who has to do heavy work and added to that a light limb cannot be easily controlled in a wind

The limbs suitable for the Kinemotor amputations cannot be described here as up to the time of writing such amputations had not been performed in the Navy

The writer has to acknowledge his indebtedness to Mr F G Ernst of Charlotte Street Fitzroy Square, London for kindly supplying the illustrations here produced Their value to this article is enhanced by the knowledge that a great many naval ranks and ratings are wearing the Ernst limbs and the privilege of reproducing these illustrations has removed the necessity of applying to firms outside London, whose limbs, though similar in essential features necessarily differ in details

In the summer of 1916 the Medical Department of the Admiralty ordered that peg-legs were to be supplied together with the artificial limbs Peg legs are made for both leg and thigh amputations and are most useful appliances, for not only are they more durable than artificial

legs, but [illegible] restful substitutes. They [illegible] same relation [illegible] a fecal leg as a slipper is to [illegible]

No permanent [illegible] should be given to a man until [illegible] a temporary [illegible] from three to six months. The [illegible] of such a step [illegible] estimated. A cone leg will [illegible] the girth of the [illegible] it will keep the muscles in [illegible] will maintain active [illegible] of the joints. Further [illegible] crutches is reduced [illegible] If on the other [illegible]

[illegible]

but is [illegible] a result has [illegible] has not [illegible] appliances may [illegible] made by the patient [illegible] plastic or paper-mache. The material used is [illegible] length and girth [illegible] adjusted to maintain [illegible] and is comfortable [illegible] and the

[illegible] A more useful but more elaborate [illegible] Thomas knee splint The splint [illegible] in length too short and a small block of [illegible] end to make up the length With the [illegible] and the splint, a bucket is made by [illegible] plaster bandages so arranged as to include [illegible] splint When the plaster is dry the bucket [illegible] and the appliance may be held on to the body [illegible] straps

These temporary legs should be worn as soon as the scar is healed and all tenderness has left the stump They should never be worn on stumps which are inflamed or have discharging wounds

Figs 1 and 2 show the type of leg supplied for hip amputations This is an extremely serviceable leg and without the patient is able to perform light work and walk any reasonable distance Below the lower level of the hip bucket the limb is covered in with washleather There is a bolt which locks the hip bucket to the thigh piece when in the erect position and this bolt can be raised by a hand in the side pocket when the patient wishes to sit

This leg is also suitable for very short thigh stumps In these cases the front of the bucket is cut away allowing the end of the stump to protrude forwards The results are not so good as they are in the hip amputations and disarticulation should be recommended in all such cases

Figs 3 and 4 show the type of leg supplied to thigh amputations where five inches of bone remain below the lesser trochanter In most such cases this leg is suitable for shorter stumps The weight of the body is chiefly borne by the tuber ischii at the top and posterior part of the bucket In this position the bucket is slightly cut away, and [illegible] in the inner side so as to avoid pressure on the pubic bone The leg is held into the body by shoulder straps and by a pelvic band This band passes round the body just below the crests of the iliac bones and it not only prevents the bucket from slipping off the stump but it also maintains the leg in the mitre line and prevents it from swinging outwards when walking This pelvic band is indispensable in short thigh stumps Mr Ernest Lumsden points that the pelvic band should be fitted to *all* thigh stumps His reasons need not be detailed here but his advice may be taken as authoritative In the upright piece of the pelvic band there is a hinge which should be at the level of the tip of the great trochanter

The knee joint is a pivot Its accurate adjustment is a matter of extreme importance from the point of view of gait It should be placed [illegible] inch behind the axis of the natural joint If the two axes are allowed to coincide slight flexion of the joint brings the line of action of the body weight behind the joint and further flexion occurs If on the other hand the axis of the artificial joint is behind that of the natural joint the line of the weight comes in front of the joint and tends to lock the

[illegible] the flexion. A [illegible] The [illegible] when desired by the belt [illegible] the [illegible] not seen in [illegible] of the [illegible] at the stump [illegible]

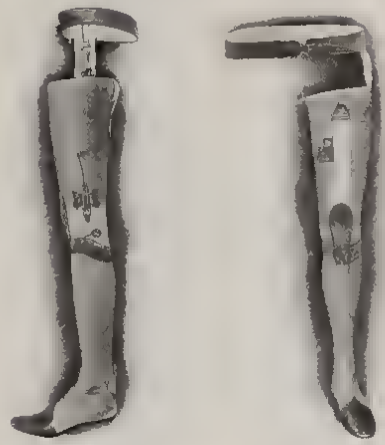


Fig. 1 Fig. 2

F[illegible] and [illegible] is to [illegible]

The ankle joint is also [illegible] and the [illegible] the foot piece. In some makes of legs this ankle joint [illegible] is replaced by a pad of indiarubber, thus giving [illegible] There is no particular advantage in such a device, [illegible] downhill is more nearly perfect with the moveable ankle.

The foot piece is generally made of wood (in [illegible] rubber) and covered over by a thin layer of rubber. [illegible] leg in the position of slight equinus with the toe [illegible]

[illegible] of the ground The foot piece is divided [illegible] movements of the fore part of the foot [illegible] limb supplied for disarticulations through [illegible] for short stumps below the knee which have

[illegible]

[illegible]

[illegible] flexed A similar leg to the [illegible] supplied [illegible] those amputations at the seat of election when the stump [illegible] returned in the leg bucket The appearance of the leg [illegible] fitting must doing a disarticulation [illegible] the knee Such a leg as advocated in the first part of this paper should

[illegible] a transected [illegible] amputation, but then the next leg shown [illegible] can be worn

[illegible] a seat of [illegible] amputation which is only just long [illegible] cases the stump has to be embraced by a leather case [illegible] but this fails to turn the stump either the leg in fig. [illegible] [illegible] a transfemoral amputation must be done to make [illegible] wearing [illegible] possible.

The [illegible] can be worn in other leg amputations [illegible] the middle third the results are perfect [illegible]

Fig. [illegible] shows [illegible] in which, on the left side there is a short [illegible] stump [illegible] for general comfort and better appearance the patient [illegible] with a Stokes Gritti amputation on the left side.

Fig. [illegible] a perfect S[illegible] by the extended [illegible] Part D [illegible] nd of the [illegible] the ground by fully [illegible]

Fig. [illegible] the leg supplied. Notice that in this leg, the [illegible] the stump [illegible] clear of the foot piece, a feature which [illegible] [illegible] and thus in these litter[illegible] [illegible] [illegible] ft imperfect

[illegible]

[illegible] the patient

Fig. [illegible] If disarticulation at the shoulder joint [illegible] with ball bearings so as to give [illegible] joint can be locked in any

[illegible] all wing the [illegible] [illegible] [illegible]

Fig. 14.—[illegible]

Fig. 15.—Arm for [illegible]

[illegible] for amputat[illegible]

[illegible] according [illegible]

the most [illegible] slip can [illegible] months [illegible]

Fig. 17 shows [illegible] A similar appliance can be applied where [illegible] With such an apparatus the disability is slight.

Fig. 17. [illegible]

# Clinical and Practical Notes.

## CLIMATIC BUBO AND A FEW EXPERIENCES IN CHINA

By Surgeon Rear Admiral J. Shand, C.B., M.B., R.N.

In [illegible] the Journal of the Royal Naval Medical Service [illegible] October [illegible] by Surgeon Commander Horace L. R. Stephens, he [illegible] Climatic Bubo [illegible] and carried me back to experiences in China [illegible] I never [illegible] to publish but which I have frequently [illegible] young [illegible] hoping that they might be of some use.

Since Commander Stephens very rightly, on purely scientific [illegible] the [illegible] climatic bubo. Pathologically it means [illegible] pathologically [illegible] I must [illegible] this great advantage at present that it may [illegible] investigators [illegible] suggestions to certain climates and then peculiar [illegible] for this disease [illegible] the lymphatic system is certainly more prevalent in [illegible] countries than in others.

I have written [illegible] the system advisedly, for I have long been convinced that although [illegible] exciting agent the inguinal and femoral glands become more frequently involved, I think others the whole lymphatic system is involved, not from [illegible] but from some other.

I was able after a [illegible] experience in hospital at Weihaiwei and in ships on the China stations to [illegible] many diseases frequently down to one common cause, and as a result of [illegible] I will give some that were cured by santonin only, and the cure of [illegible] either directly or indirectly, was the round worm.

- Intestinal Diseases
  - Chronic [illegible]
  - Colitis and enteritis
  - Dysentery
  - Intestinal obstruction
  - Appendicitis
  - Gall stones and jaundice
  - Ulceration
- Respiratory System —
  - Chronic bronchial catarrh
  - Asthma
  - Chronic pleural effusion
- Nervous System —
  - Neuralgia in malarial in various parts of the body
- Lymphatic System
  - Enlarged glands—chiefly groin and axilla
- Blood —
  - Splenomegaly
- Connective Tissue —
  - Chronic abscesses
    - The cold abscess, so called without any apparent or discernible pathological cause [illegible]

I had cases under my care of every one of these diseases which were found to be accompanied by eosinophiles and in all probability caused by this parasitic parasite and at any rate cured only after its removal and frequently almost in a miraculous way, as in the cases of neuralgia and asthma of two or three years standing.

In consequence of these results I thought it advisable to warn medical officers in ships to be on their guard and although at first my views were rather flouted by some I had the satisfaction of knowing that they agreed with me in the end.

Diagnoses and treatment were altered accordingly with great advantage to the patients and to the Service

I offer these remarks as a small contribution to the literature on "Climatic Bubo and Tropical Diseases" generally, hoping that they will induce medical officers in H M Service to bear in mind the importance of intestinal parasites as a cause of many diseases in tropical and subtropical countries especially In this connection I have not the slightest doubt that in China where as Surgeon Commander Stephens remarks, tuberculosis is very prevalent (though milk is not a recognized food), the round worm either by lowering resistance or causing ulceration of the intestines and infection thereby is a powerful agent in the extension of the disease

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## SYPHILIS STANDARDIZATION OF TREATMENT IN SHIPS

By Surgeon Commander R H McCLELLIN O B E M B, R N

In 1920 Surgeon Captain Kilvey started a campaign in the Mediterranean Fleet for the treatment of syphilis and in the following year sent an article to the JOURNAL OF THE ROYAL NAVAL MEDICAL SERVICE giving details of administration and a table of results obtained I followed with an article in the Journal at his request, giving a table of results, but refrained from giving my definite opinion for or against the method In the last number of the Journal there is an article by Surgeon Lieutenant Commander Tover pleading for the standardization of treatment, and as I am now convinced of the excellence of the method adopted in this Fleet I voice my opinion in the hope that the Powers that be may consider them and standardize treatment

I have had a certain amount of experience of all three methods—intravenous three years hospital subcutaneous and intramuscular two years afloat

I will take the pros and cons of these different methods and try and deduce evidence to show what I imagine to be the only method feasible afloat I imagine will agree that each of these methods has been tried and found satisfactory It only remains therefore to prove which is the best to adopt

*Intravenous* — An excellent method ashore or in large ships but ruled out for small ships because (1) Difficulties of giving it properly are bad (2) owing to rapid absorption it is unwise to use it under adverse conditions (3) difficulty of giving it in rough weather

*Intramuscular* — I would never use the method either ashore or afloat as (1) *Hospital* Intravenous method better (2) *Afloat* Objections are many (a) Painful (b) absorption bad (c) risk of needle breaking (d) risk of abscess

At different times I have discussed the question with my colleagues in the fleet and most of them if not all agree it is an unsatisfactory method and that sooner or later patients refuse to have it

*Subcutaneous* — *Afloat* A most satisfactory method (1) Painless administration (2) abscess formation rare (I have never seen one) (3) no chance of needle breaking and case having to be sent to hospital (4) large numbers can be given injections in a short space of time (5) unnecessary to place patient in bed (6) men are enthusiastic about method (7) can be given at any time in any place

*Hospital* — Intravenous better method as a full course can be given in a shorter time, saving days sickness and expense

To sum up my opinion is that the treatment of syphilis in ships (depots included) should be standardized on these lines No diagnosed syphilitic case should be sent to hospital except for Wassermann tests or for treatment in emergencies as men under treatment in ships or in depots can be transferred from one to the other with their Syphilis Index Card and continue their treatment till cured

The [illegible] on board the [illegible] will give briefly [illegible] courses of sulfars [illegible] comes follow [illegible] consists of [illegible] of [illegible] forty eight [illegible] rest, [illegible] after the first [illegible] half course of six injections [illegible] however that patient should [illegible] of [illegible] course comes whether full or half [illegible] system [illegible] will not touch on the technique as [illegible] of injections have been given on board with [illegible] will now confine with a table of results obtained [illegible]

[illegible] negative Wassermann prior to commencing treatment [illegible] the first time and were given a further course of [illegible] having two consecutive negatives following two [illegible]

[illegible] left the ship before treatment could be completed [illegible] two spirochaetes though Wassermann was negative [illegible] on board was given intramuscularly

H M S *King George V*

| No. | Year | [illegible] | W. before treatment in H M S *King George V* | Treatment in H M S *King George V* | W. after treatment in H M S *King George V* | Latest Wassermann positive or negative | Number of months after commencing treatment in H M S *King George V* |
|---|---|---|---|---|---|---|---|
| 1 | [illegible] | [illegible] | [illegible] | S N A B sulfarsenol | + Neg | Pos Neg | 4 9 |
| 3 | [illegible] | [illegible] | – + | [illegible] | [illegible] | [illegible] | 17 |
| 1 | [illegible] | [illegible] | – – + | [illegible] | [illegible] | [illegible] | 15 |
| [illegible] | [illegible] | [illegible] | + | [illegible] | [illegible] | [illegible] | 13 |
| [illegible] | [illegible] | [illegible] | Neg | [illegible] | [illegible] | [illegible] | 7 |
| [illegible] | [illegible] | [illegible] | | S N A B sulfarsenol | | | 15 |
| [illegible] | [illegible] | [illegible] | | [illegible] | | | 6 |
| [illegible] | [illegible] | [illegible] | Neg | [illegible] | | | 6 |
| [illegible] | [illegible] | [illegible] | | [illegible] | | | 18 |
| [illegible] | [illegible] | [illegible] | Neg | [illegible] | | | 9 |

| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
|---|---|---|---|---|---|---|---|---|
| 1 | [illegible] | 8 N A B [illegible] | [illegible] | [illegible] | [illegible] | Neg. | Neg. | 9 |
| | | 8 N A B [illegible] | | | | | | |
| 13 | [illegible] | 3 galyl [illegible] | [illegible] | [illegible] | | | | 8 |
| 14 | 1918 | 6 galyl 1918 | [illegible] | 8 | 8 N A B | — | | 19 |
| | | 6 N A B [illegible] | | 8 | sulfarsenol | | | |
| 15 | 1918 | 6 salvarsan 191[illegible] | [illegible] | 8 | | — | | 5 |
| | | 7 N A B [illegible] | | | | | | |
| 16 | 1919 | 6 N A B 191[illegible] | | 8 | | — | | 9 |
| | | 8 N A B 191[illegible] | | | | | | |
| | | 8 N A B 191[illegible] | | | | | | |
| 17 | 1919 | 8 N A B 191[illegible] | | | | — | — | 12 |
| 18 | 1919 | 8 N A B 191[illegible] | | | — | — | — | 3 |
| | | 8 N A B 191[illegible] | | | | | | |
| 19 | 1919 | 7 N A B 191[illegible] | | | — | — | — | 10 |
| 20 | 1919 | 7 N A B 191[illegible] | — | | — | — | — | 5 |
| | | 6 N A B 191[illegible] | | | | | | |
| 21 | 1920 | N | — | | 8 N A B | | | 19 |
| | | | | | sulfarsenol | | | |
| 22 | 1920 | 7 N A B 191[illegible] | | | 8 | — | — | 11 |
| | | | | | [illegible] | | | |
| 23 | 1920 | N | | — | 8 N A B | | | 17 |
| | | | | | sulfarsenol | | | |
| | | | | | 8 | | | |
| 24 | 1920 | N | — | | 8 N A B | " | | 18 |
| | | | | | 8 sulfarsenol | | | |
| 25 | 1920 | 8 N A B 191[illegible] | | Neg | 8 | " | " | 11 |
| 26 | 1920 | 8 N A B 1921 | | | 8 | " | | 0 |
| 27 | 1920 | 8 N A B 191[illegible] | | " | 6 | " | " | 7 |
| | | 8 N A B 1921 | | | | | | |
| 28 | 1921 | N | | + − + | 8 | " | — | 11 |
| | | | | | 8 | | | |
| 29 | 1921 | N | | + + + + | 8 N A B | " | | 9 |
| | | | | | 8 sulfarsenol | | | |
| 30 | 1921 | 8 N A B 1921 | | + + + + | 8 | " | " | 14 |
| 31 | 1921 | 8 N A B 1921 | | Neg. | 8 | " | | 0 |
| 32 | 1921 | 8 N A B 1921 | | + + + − | 8 | " | " | 0 |
| 33 | 1921 | 7 N A B 1921 | | Neg. | 8 | | | 9 |
| 34 | 1921 | 8 N A B 1921 | | | 8 | " | " | 3 |
| 35 | 1921 | 8 N A B, 1921 | | | 6 | " | " | 8 |
| | | 8 N A B 1921 | | | | | | |
| 36 | 1921 | 8 N A B 1921 | | | 8 | " | | 11 |
| 37 | 1921 | 8 N A B 1921 | | | 8 | — | " | [illegible] |
| 38 | 1921 | 8 N A B 1921 | | | 8 | — | — | 9 |
| 39 | 1921 | N | | | 8 | | | 9 |
| | | | | | 8 | | | |

# Reviews.

THE WYNN [illegible] AERO CHLORROSCOPE (1922 M[illegible]) [illegible] AND O[illegible] A NEW DEVICE By W Wyn[illegible] [illegible], F R C S 19[illegible] [illegible] Bale Sons and Danielsson Ltd [illegible] 8vo paper cover [illegible] with two illustrations Price 2s 6d net

Many improvements appear to have been effected in this instrument The illumination [illegible] good in the old pattern has been altered Reflected light is still employed but the arrangement of the lenses and mirrors is different [illegible] resulting illumination is claimed to be as good as that obtained by the direct light method [illegible] with the small lamp at the end of the urethroscopic tube If this is so there is a big point in favour of this instrument because in practice work it is little to have the lumen of the tube quite free for the instrument being employed Also the small lamps are fragile have frequently to be replaced, and sometimes get dim and cause logging

Another great advantage of this model lies over the old one is the method of carrying out operative procedures in the urethral mucosa To give the necessary range of movement to the instrument the concentric hood has been discarded Instead a flexible handle carrying the knife tip is allowed entry into the top of the urethroscopic tube through an aperture made air tight by a rubber washer and compressing screw as in the Cabot shell instrument This handle is carried down the tube in a small groove, stopping short of the end so as to allow the knife to be safely within its tube The obturator is grooved to take this passage To use the instrument the knife is pushed down to the required point and the cutting, [illegible] or whatever is to be done is carried out by the movement of the complete instrument

The examining tubes range from 18 to 26 and the operating from 21 to 26, Charrière Two prostatic tubes are supplied one with a window allowing examination of the floor of the posterior urethra The other is a straight tube with a lobster tail obturator They can be used with air distention and for operations.

There is one point in this pamphlet which draws special attention The author writes The central figure which occupies such a prominent place is the former teaching of urethroscopy I could not worry the student of the inflation method as he does not concern himself with the appearances of the mucous membrane in the collapsed state We think we should find ourselves very much adrift at times if we did not carefully note the central figure Air distention blanches the mucosa and changes the real appearance of its surface which may help one to decide whether an abnormal appearance of the glands or follicles is due to an inflammatory disease or to post disease G B S

A TREATISE ON GONORRHŒA AND ITS COMPLICATIONS By Dr Georges Luys Late Assistant to the Urological Clinique, Hôpital Lariboisière Paris Private Practitioner of the Health de Maisons Paris Chief Medical Officer of the Urological Centre at the Military Hospital, Versailles Translated and Edited by Arthur Foerster Captain R A M C (T C) M R C S L R C P Lond Late Resident Medical Officer London Lock Hospital Third Revised Edition 1922 London Baillière Tindall and Cox 8 Henrietta Street Covent Garden Pp xvi + 400 With 212 illustrations and 5 coloured plates Price 21s net

Dr Georges Luys has long since established himself as a urologist of international repute hence it is a pleasure to welcome a translation of the third edition of his textbook on gonorrhœa Praise has already been bestowed on former

[illegible] and [illegible] to [illegible]

[illegible] syphilis [illegible]

[illegible] the best [illegible] and [illegible] tion [illegible] is the [illegible] opt to [illegible]

The [illegible] the pathological diagnosis [illegible] high [illegible] natural that [illegible] great [illegible] devoted [illegible] of page to this and [illegible] himself with the [illegible] difficulties and dangers [illegible] to consult Chap [illegible] pages) The plates in this [illegible] helpful

Special warning [illegible] printers [illegible] 0·01 p [illegible] and in the [illegible] assuming from the [illegible] (He [illegible] calls a [illegible] of collapse [illegible] the method [illegible] 1000 [illegible])

Gowers's [illegible] which fail to [illegible]

Very rightly [illegible] the rater forms of [illegible] the more common

Infiltration of the [illegible] regarded favourably

Lilys is an advocate of [illegible] [illegible] practically all cases Solutions [illegible] of silver are used for choice [illegible] salts to be gained by the use of [illegible] methods maintained by [illegible] analyses caution to the use of [illegible] continued use of which is a [illegible] methods we get one of the [illegible] recent methods (sodium [illegible] electrolyte dilution) the [illegible]

It is to be regretted [illegible] dealing with the significant questions of [illegible]

The plates and figures are consistently good

The printing is not above [illegible] The paper is [illegible] makes the book uncomfortably weighty Carelessness [illegible] should be corrected in future editions [illegible] in the text on page 50 line [illegible] should read fig 19 and on page [illegible] 110 should be read fig 110 On other pages [illegible] previous and does for this cannot escape notice

The translator has done his work well but no doubt [illegible] language of the word [illegible]

Such [illegible] the work which [illegible] undoubtedly [illegible] most [illegible] [illegible] Africa All medical men interested [illegible] their library R J G P

[illegible] DISEASES By E R Stitt A B [illegible] M D Surgeon [illegible] U S Navy London H K [illegible] 1922 [illegible] With 15 page illustrations Price [illegible]

[illegible] edition of [illegible] most valuable handbook of Tropical [illegible] which enhances its [illegible] Lee demanded shows the great popu[illegible] [illegible] from 524 to 610 pages, the [illegible] has been carried out and is most con[illegible]

[illegible] many subjects have had to be [illegible] introduced including chapters on [illegible] like disease in America affecting jack[illegible] [illegible] which it is transmitted to man [illegible] Tsetse fever &c and very exten[illegible] [illegible] diagnostic methods The book [illegible] to all [illegible] countries as a small [illegible] information to come to [illegible] tropical disease Some of the [illegible] very poor [illegible] 30 330 336 these might be [illegible] improved with advantage P W B S

INFLUENZA WITH SPECIAL REFERENCE TO THE RUSSIAN EPIDEMICS By J M Mitchell L N Ashkshov and G P N Richardson London Baillière, Tindall and Cox Pp 48 Price 3s 6d net

The above book gives a brief description of the main features of typhus fever as seen in the Russian epidemics The first three chapters deal with symptomatology [illegible] and treatment and cover much the same ground as an ordinary text-book In the last chapter the preparation and use of a prophylactic vaccine made from the blood of typhus fever cases is described A very limited experience of this vaccine points to its conferring a distinct immunity and therefore it is well worth a further trial A notable omission in the book is the complete absence of any mention of Rickettsia bodies in the paragraphs on aetiology

The book is a handy summary for those who may be suddenly called on to deal with a typhus epidemic

TSETSE FLIES THEIR CHARACTERISTICS DISTRIBUTION AND BIONOMICS With some account of possible methods for their control By Major E E Austen, D S O, and Emile Hegh with a preface by the Earl Buxton G C M G London The Imperial Bureau of Entomology Pp ix + 188 Price 7s 6d net

This book supplies a real need It condenses into a small space all the reliable facts concerning the genus Glossina which were previously scattered through a host of scientific periodicals The extent of the literature consulted can be gauged by the bibliography given in Chapter XX. Naval medical officers should remember that several cases of trypanosomiasis have occurred in naval ratings The importance of tsetse flies as the vectors of disease in man and his domestic animals cannot be exaggerated when it is realized that large tracts of fertile country are rendered practically uninhabitable because of this fly

This book written by so high an authority as Major Austen is therefore indispensable to all scientific officers whose duties take them into the endemic area,

giving [illegible] pests [illegible] the reproduc[illegible] photograp[illegible] done

The book is [illegible] English zoo[illegible]

A Practical Introduction on the Diseases [illegible] Bernard Myers C.M.G. M.D. Ed. M.R.C.P. Lond. [illegible] Hospital for Children and Women [illegible] Children at the Child en's Clinic [illegible] H. K. Lewis and Co. Ltd. With 61 illustrations [illegible]

Dr. Bernard Myers reputation as a [illegible] we took up this book with pleasurable anticipation

The chapter on feeding diets [illegible] to purposes of reference is invaluable. The chapters [illegible] children we find frankly disappointing

The author describes his work as a [illegible] practitioners and senior students. From this [illegible] acute colitis myelitis should escape attention [illegible] considering the differential diagnosis of [illegible] mentioned

Again there is no reference anywhere [illegible] refraction in the growing child

The illustrations are small and some of [illegible] no interest

The index as is the case unfortunately [illegible] much to be desired

Chloroform Anæsthesia. By A. [illegible] With foreword by Arthur R. Cushny M.D. [illegible] John Bale Sons and Danielsson, Ltd. [illegible] Illustrated Price 7s. 6d. net

This little book of some 150 pages [illegible] on a highly important subject. Certain sections [illegible] have been educated in the southern schools [illegible] perhaps unwholesome apprehension of [illegible] in cutlery

In these days of intense progress [illegible] when theory and the laboratory battle on [illegible] the necessity of including in the text [illegible] of tetanus electro cardiograms [illegible] under varying intensities of [illegible] then we are inclined to consider [illegible] toxicology chemistry and physiology [illegible] some value as mainly elaborate for the [illegible] practical guidance to the successful [illegible] stances. The chapters on Methods and [illegible] of value "suction" and "of plenum" [illegible] inhaler [illegible] full detail but again we seem to miss the point of teach that [illegible] look for when reading the written evidence of another human experience. [illegible] we will quote in conclusion as it entirely agrees with our own [illegible] deference due to an anæsthetist. "Nothing should be allowed to disturb the patient during induction. No dressings should be touched until the patient is

[illegible] state if [illegible] in any [illegible]

[illegible] THE [illegible] Being [illegible] Edward Smith M R C S [illegible] the West [illegible] by his son [illegible] Steam ship Company late [illegible] London A and C Black Ltd 1922 [illegible] Sketch maps and appendices Price [illegible]

*Vom [illegible] the sea*

This diary gives a detailed [illegible] which fulfil the [illegible] of a whole ship of [illegible] this in Davis Strait 1867 A two months [illegible] left out over [illegible] the ship was in [illegible] and was [illegible] more than once [illegible] lifted [illegible] sea and her rudder [illegible] Only three [illegible] in safety

The Surgeon was a hero [illegible] kept watch [illegible] assisted with the sails [illegible] exhausted [illegible] improvised stump [illegible] elorate of [illegible] supplied by the [illegible] the cooper

The book is [illegible] shrewd observations on the [illegible] of [illegible]

A book of keep [illegible]

[illegible] AND THE TEMPERANCE [illegible] Hall M B Lond The Anti Prohibition League [illegible] W 1 [illegible] Price [illegible]

This is a paper [illegible] place agitations by [illegible] Practitioner [illegible] agitations [illegible] to total abstinence [illegible] the use of alcohol [illegible] old Horatian maxim

There is a medium in all things

The matter in dispute has [illegible] him from the points of view [illegible] his conclusions are that it is [illegible] not [illegible] is a symptom [illegible] but that it is necessary to [illegible] the disease which is [illegible] the evil [illegible] people live that is to say [illegible]

[illegible] matter, this little book is [illegible] founded on [illegible] judgment

# Preparations, &c.

PHYTIN, DIGIFOLINE, DIAL COAGULEN, AND LIPOIDINE—CIBA BRAND

(Sole Agents: [illegible] Company, Ltd., Pharmaceutical [illegible], 84 Upper Thames Street, E.C.4.)

**Phytin** is the [illegible] magnesium salt of inosite hexaphosphoric acid obtained from plant seeds. Organically combined inosite hexaphosphoric phosphorus is present to the extent of about 22 per cent. [illegible] phosphorus content of about 18 per cent. **Ferrophytin** is [illegible] salt of inosite hexaphosphoric acid and contains 5½ per cent. [illegible] cent. of phosphorus. **Quinine Phytin** is the quinine salt of [illegible] phoric acid, contains about 60 per cent. of quinine and is [illegible] water.

**Digifoline** may be administered by the mouth in the form of tablets (1½ [illegible]) or may be injected hypodermically and intravenously. It is known that many persons show intolerance of the ordinary tinctures and infusions of digitalis due, according to some authorities, to the presence of saponin. Digifoline, which is a standardized constant and permanent preparation containing the glucosides of digitalis in their natural proportions, the saponins have been eliminated, with the result that its administration does not cause gastro-intestinal disturbances.

**Dial Coagulen** and **Lipoidine**.—Since these products were noticed in the Journal (vol. viii, No. 2), reports have been received on them from the various naval hospitals. **Dial** has been found a most successful hypnotic, especially in cases where there is no pain. It has also proved effective in insomnia, insomnia associated with neurasthenia or alcoholism, excitation and restlessness. It is free from unpleasant effects. **Coagulen Ciba** has been employed with satisfactory results in the dissection of a prepuce for burns and plastic operation on the palm of the hand. In both cases the capillary oozing was entirely arrested, no ligatures being used. It also acted well in arresting hemorrhage after removal of tonsils and has found useful in treaching for [illegible]. When used to swab the stump after an amputation through the middle of the thigh, there was practically no hemorrhage on removal of the tourniquet. **Lipoidine Ciba** has been found to present a pleasant method of administering cod liver oil without producing symptoms of indigestion when the liver was loaded.

# News of the Service.

## OBITUARY

[illegible] deaths at Fleet Surgeon Joseph Henry [illegible] Naval Hospital Plymouth on November [illegible] [illegible] at Queen's College Galway in [illegible] 1842 [illegible] assistant surgeon in August 1868 and [illegible] [illegible] placed on the retired list at his own request [illegible] 1900 in [illegible] Superintendent of the Royal Hamadryad Seamen's [illegible] Admiralty Surgeon and Agent Stonehouse [illegible] [illegible] was [illegible] thanked for his services by the S N O [illegible] [illegible] valuable service rendered during the Benin Expedition [illegible] [illegible] Hospital [illegible] [illegible] high professional ability [illegible] [illegible] Surgeon Lieutenant Commander [illegible] M A [illegible] S [illegible] whom our sympathy is extended

Inspector General Francis Y [illegible] Thomson [illegible] 1890 [illegible] [illegible] died at Fleet Hospital Plymouth on April 27 1897 and was buried on April 1 1897 [illegible] [illegible] surviving [illegible] is the son of the late Rear Admiral [illegible] [illegible] Fitzroy

## CORRECTION

[illegible] Surgeon Rear Admiral C [illegible] was [illegible] [illegible] was [illegible] Chatham [illegible] was [illegible] to [illegible] [illegible] the R N Hospital Chatham

## HONOURS AWARDED

[illegible] decorations previously conferred by Her Majesty the Queen [illegible] [illegible] mentioned officers by Commander [illegible] Navy [illegible] [illegible] 10 Surgeon Commander Henry C Wh[illegible] R N [illegible] [illegible] Class Surgeon Commander Colin E Sp[illegible] R N [illegible] [illegible] [illegible] [illegible] pleased to give orders for the following appointments [illegible] [illegible] the Military Division of the Third Class or Companion [illegible] [illegible] Surgeon [illegible] M B

## DEGREES AND DIPLOMAS

[illegible] R [illegible] G S Bed M B F R C S M R C P [illegible] [illegible] the Medical Council on the Medical Examination [illegible] [illegible]

## PROMOTIONS

[illegible] Maclean D S O M B promoted to the rank of Surgeon Rear [illegible]

[illegible] Lieutenant J Forbes Forrest C Holly of O [illegible] James [illegible] M B B A [illegible] Moxon Bewick and Algernon F [illegible] Surgeon Commander [illegible] from Retired List [illegible]

[illegible] Surgeon J. M. Kinnigan and J. H. J. [illegible] M. [illegible] to be rank [illegible] from October 17, 1922. [illegible] N. Kalelfe promoted to be Surgeon Lieutenant Commander [illegible] 1922.

[illegible] R. Johnston promoted to be Surgeon Lieutenant Commander [illegible] 1922.

[illegible] W. H. J. Colbeck promoted to the rank of Surgeon Commander [illegible] October 11, 1922.

[illegible] Lieutenant Commander [illegible] Surgeon Captain [illegible] Richard H. Nunno, M.A.D., Richard F. [illegible] and Reginald S. [illegible] M.B., F.R.C.S., M.R.C.P., D.P.H., Barrister at Law, to be Surgeon Captain [illegible] December 31, 1922.

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## ROYAL NAVAL MEDICAL COMPASSIONATE FUND

At the Quarterly Meeting of the Director of the Fund held on October 17, three cases were considered and £50 voted to the relief of the [illegible] of the deceased.

A few aged 62 years, of a [illegible] in the Royal Navy, died in Nassau. Has Suffers from deafness, which renders her quite helpless and is absolutely dependent on others. Voted £10.

Daughter aged 72 years, living on an income of the Royal Naval Benevolent Society, [illegible] income to the extent of £[illegible] a year, [illegible] age she is unable to do [illegible] work. Voted £50.

Widow aged [illegible] years, of [illegible] Royal Naval [illegible] Injury in [illegible] to be [illegible] assistance on a comfortable [illegible] Voted £[illegible].

Medical Officers of the Active List [illegible] Navy will be [illegible] invited to do so at an annual subscription [illegible] Honorary Secretary, Naval Medical Compassionate Fund, Medical [illegible] the Navy, Admiralty, S.W.1.

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## ADMIRALTY ORDERS ISSUED FROM AUGUST 15, 1922, TO NOVEMBER 15, 1922

(Only the more important Orders pertaining directly to the duties of the Medical Officers affected and not confidential are included.)

**2912. Travelling Expenses—Hire of Cabs by Surgeons R.N. when Visiting Sick Ashore**

(C. (II) 1311 — 19/9/22.)

From the extract of the revised accounts of H.M. Ships and Establishments it appears that considerable expenditure has occurred in cabs hired by Medical Officers when engaged in the course of their duty in visiting sick officers who are in the operation of overseas stations. The reasonable travelling allowances are exceeded in many instances, particularly at the Home Ports, and cabs are hired in cases of emergency, when other means are practicable, or in cases where the officer, in his own exercise and discretion, considers it necessary for his own health, which could be fully explained on his return.

Paragraphs 1 and 2 of the Order which relate to normally ill-health are cancelled by paragraphs 1 and 2 of A.F.O. 1103/22.

(A.F.O. 1103/22.)

**2969. Retired Pay—Surgeon Commanders R.N.**

(C.W. 10822 — 8/11/1922.)

The amendment of the rates of retired pay of Surgeon Commanders R.N. under the new regulations, on reaching the age limit, [illegible] maximum rate of retired pay of £417 10s. (i.e. the maximum obtainable under the former regulations, but not on retirement at the age of 55) as the result of a review of their assessment of retired pay consequent on a reduction in the cost of living, is confined to those Officers who were actually on the list of Surgeon Commanders on 1st July, 1919, under the sanction of the reversion to pay was made.

The words "of seniority of 1st July, 1917, and earlier" in the final line of A.F.O. 1612/22 should therefore be amended to read "of seniority of 1st January, 1917, and earlier."

A.F.O. 1612/22.

# Notices.

The [illegible] Medical Officers to [illegible] Papers of [illegible] personal experience [illegible] Items of news [illegible] the Naval Medical Service will be welcomed [illegible] ships and [illegible] Foreign and Colonial [illegible]

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Volume IX April 1921 No. 2

Journal
of the
Royal Naval Medical Service.

## Original Articles.

### THE CEREBRO-SPINAL FLUID IN HEALTH AND DISEASE.

By Surgeon Commander THOMAS B. SHAW, M.B., R.N.

The examination of the cerebro-spinal fluid (C.S.F.) as a means of diagnosis in disease has only come into use during recent years and it was not until the epidemics of cerebro-spinal meningitis made their appearance during the war that the operation of lumbar puncture began to be generally used in this country. Although much of the pathology of the fluid still remains obscure, many important facts have been brought to light. We know that in certain diseased conditions of the central nervous system, very definite changes occur in the C.S.F. which recognized by laboratory methods, are important indications of the nature of the disease present. Nowadays examinations of the C.S.F. form an important part of the routine work in the clinical laboratory and in many cases lumbar puncture will at once clinch the diagnosis.

It is to Heinrich Quincke that we owe this useful method of diagnosis. This celebrated clinician was born in Frankfort, studied in Berlin and was for thirty years professor of medicine at Kiel. He died in May last year at the age of 80. The operation of lumbar puncture as now practised we owe to the results of his experiments on dogs when investigating the chemistry of the C.S.F.

To understand the different changes which may occur in the fluid in disease and appreciate their significance, it is essential to bear in mind not only the characters of the normal C.S.F. but also the main points bearing on the anatomy of the spaces in which the fluid is contained. Before considering therefore the various points in diagnosis indicated by the fluid in disease, it is proposed to describe briefly the anatomy of the cerebro-spinal

[illegible] spaces and then describe the C S F as it is found there in [illegible] of health

Over a large part of the surface of the brain the subarachnoid space is purely a potential one The pia mater it will be remembered provides sheaths for the vessels entering the brain and invests the latter very closely Unlike the arachnoid, which is more lax and bridges across the numerous sulci the pia dips down between them and in these areas the subarachnoid space is definitely present The space is especially marked over the base of the brain where we find the three large cisternæ The subarachnoid space is broken up by a meshwork of very fine trabeculæ which passes in an interlacing manner between the two membranes which enclose it As the arteries which supply the brain enter its substance they pass through the space and carry with them prolongations of the pia mater and so are surrounded by perivascular spaces containing the C S F By this close connection between the blood-vessels and the C S F spaces it would appear very possible that drugs given intravenously would readily affect the C S F, but as a matter of fact this very rarely happens The spinal subarachnoid space which differs considerably from that in the brain is directly continuous with the latter through the foramen magnum The arachnoid as it leaves the dorsal aspect of the medulla bridges over the interval between the latter and the cerebellum forming the cisterna magna. On the anterior aspect of the medulla the membrane passing thence to the anterior surface of the pons forms the cisterna pontis And in front of the pons the arachnoid passing forward and on either side to the projecting temporal lobes forms the cisterna basalis which contains the blood-vessels forming the circle of Willis, the third, fourth, and root of the fifth nerves the optic tract and chiasma and infundibulum The fluid in the large basal sinuses is in free communication with that in the small spaces over the surface of the brain From the cisterna basalis a well defined channel on either side passes into each Sylvian fissure and at its anterior extremity the space continues into the great longitudinal fissure above the corpus callosum The Pacchionian bodies which are found on either side along the superior longitudinal sinus are projections of the subarachnoid space to which they are attached by narrow pedicles, and by means of these bodies fluid can pass between the subarachnoid space and venous sinuses Free communication exists normally between the C S F in the various ventricles of the brain and the subarachnoid space From the lateral ventricles to the third ventricle it passes by the foramen of Monro From the third to the fourth it passes by the aqueduct of Sylvius, and thence it is in communication with the cisterna magna and subarachnoid space through the foramen of Magendie in the roof of the fourth ventricle, and the foramina of Luschka two small openings one on either side of the roof We have seen the connection between the space and venous sinuses through the Pacchionian bodies Connection with the outside is also made along the arachnoid sheaths of the nerves at the base of the brain through their lymph

channels This connection according to Cunningham is most complete in the case of the optic and olfactory nerves A very free connection is said to exist between the subarachnoid space and the lymphatics of the nasal mucous membrane and this is believed to be the route of infection in cerebro spinal meningitis

In the spine we find that the subarachnoid and pia are more separated than in the brain, and the subarachnoid space containing the C S F is correspondingly larger The cord lies suspended in this space surrounded by the C S F As the cord diminishes in size to end at the lower border of the body of the first lumbar vertebra the space increases in size and in the region of the fourth and fifth lumbar vertebræ forms a large cavity through which run only the roots forming the cauda equina and the filum terminale The space is not trabeculated as in the cranium but is divided longitudinally on the posterior aspect by the subarachnoid septum which connects the arachnoid with the pia opposite the posterior fissure of the cord

The C S F is secreted by the cells forming the epithelial lining covering the choroid plexuses in the lateral, third and fourth ventricles The normal amount present is variously stated Treves in his Surgical Anatomy gives it as 130 to 150 c c (4½ oz ) most other authorities put the normal amount lower than this—about 80 c c The normal fluid is a clear colourless liquid like distilled water and yields no deposit on standing In health the pressure varies but it is low and it is estimated for clinical purposes by the rate of flow through the lumbar puncture needle which is about one drop every two or three seconds

The specific gravity is 1003 to 1008 It is faintly alkaline containing traces of sodium and potassium as chlorides carbonates and phosphates Proteins are present as albumin and globulin in very small amounts, but as we shall see later may be very markedly increased in disease Normally about 0 1 per cent glucose is present, so that as a rule we find that Fehling's solution is reduced Under normal conditions very few cells are present—about 3 to 7 per cubic millimetre—and these are chiefly lymphocytes with an occasional endothelial cell or polymorph

If the number of cells is 10 per cubic millimetre or over the condition is pathological

In the changes due to diseased conditions we have to consider all the alterations in the above normal characters and these are best studied under the following headings —

(1) Pressure , (2) Amount , (3) Naked-eye appearance (4) Chemistry (5) Cytology (6) Bacteriology , (7) Wassermann or Specific reaction

It is not proposed in this paper to describe the operation of lumbar puncture, but perhaps a few points should be mentioned which after a certain amount of experience, are considered by the author essential to success

The position should be such as to obtain the maximum convexity in the lumbo sacral region, so that the intervals between the spines are at

the [illegible] and about and [illegible] all the sitting position with the head bent well forward is recommended, but in all cases the writer has always used the lateral position, the patient lying in bed with the buttocks projecting over the edge, the legs flexed on the abdomen and the head and shoulders curved forwards The landmarks must be accurately defined and it will be found that in well developed individuals deep pressure is necessary to determine the lumbar spines Mark the tips of the fourth and fifth lumbar spines with a skin pencil or ink Enter the canal by passing the needle through the centre of the fourth interspace exactly in the middle line Some books tell you to enter the needle to one or other side of the middle line so as to avoid piercing the interspinous ligaments which in elderly patients may offer a good deal of resistance But it will be found that by keeping exactly in the middle line there is greater control of the direction of puncture and success will be more certain The middle line should be entered perpendicular to the plane of the operation or at most with the point of the needle passing slightly upwards After you have carried out several lumbar punctures you know instinctively by the feel of the needle when the point is free in the subarachnoid space If the first attempt fails and two or three alterations in the direction of the needle—after slight withdrawal—fail, remove the needle, define the spines again accurately with the fingers of the left hand and reinsert If you are again unsuccessful try the third interspace

The operation causes little pain but as a rule it is advisable to use a local anæsthetic and the injection of novocain or eucaine at the site of the puncture is better than freezing In patients who are restless or delirious, as may occur when we are dealing with cerebro-spinal meningitis or other acute meningeal conditions, a general anæsthetic may be necessary

To return to the examination of the fluid we note —

(1) *The Pressure* —In fluid under normal pressure it comes out drop by drop very deliberately, one drop every two or three seconds is considered normal and only about 10 c c of fluid can be obtained An increase in pressure is an important sign in disease and is recognized by an increased rapidity in the flow the drops coming in an almost continuous stream or in very marked cases the fluid may spurt through the needle and you can obtain much more than 10 c c An increased pressure is common in all forms of meningitis for example streptococcal and pneumococcal, also tuberculous and syphilitic It may also be present in meningismus a condition of meningeal irritation which may occur in pneumonia or typhoid, and which is due to a toxæmia and not to actual meningitis Other causes of increased intracranial pressure will also increase that of the cerebro spinal fluid for example, tumour hæmorrhage and uræmia

(2) *Amount of Fluid* —Under ordinary conditions it is difficult to obtain more than 10 c c In inflammatory and other conditions causing an increase in the amount and pressure, much larger amounts can be obtained

A [illegible] indicator when performing lumbar puncture to reduce [illegible] rate of the flow, when this has become normal—one drop [illegible] seconds—the needle should be withdrawn As much as [illegible] has been removed without any disturbing results.

(3) *Naked eye Appearance*—A turbidity varying from the merest trace to a definite opacity indicates an inflammatory condition of the meninges When present it is due to an increase in the cellular content, and in such cases you will find the fluid also increased in amount A faint turbidity may only be detected by comparing the sample in a test tube with a similar tube containing distilled water In severe inflammatory conditions the fluid may be frankly purulent. A coloration due to blood as a result of the actual puncture is practically never seen, but a bloody fluid may be obtained in a case of cerebral hæmorrhage into the ventricles or traumatic hæmorrhage of the brain or cord it is commonly found in fractures of the base It should be noted that a C S F containing only a slight increase in the number of cells, as happens for example in dementia paralytica and tabes dorsalis, does not show any opalescence or turbidity which can be recognized with the naked eye Besides the presence or absence of turbidity we note also the presence or absence of threads or flakes of fibrin These are never present in a clear fluid but may be seen in one which is turbid giving a further indication of an inflammatory condition A portion of the fluid if allowed to stand for some hours will show in inflammatory conditions a network of fibrin Normal fluids or fluids in which an increase in the amount is due to transudation only do not show any appreciable amount of fibrin after standing

(4) *Chemical Examination*—Normally, as we have seen, a very small amount of protein is present as serum albumin and globulin A definite increase is found in practically all inflammatory conditions of the cerebral or spinal meninges The increase in albumin can be detected at once by boiling In inflammatory conditions a cloud of albumin will be seen or a definite coagulum in place of the very faint opalescence which we see in the normal fluid But a more delicate method for estimating increased protein content which is frequently so very slight is the globulin test There are several methods of estimating the globulin increase One of the simplest is that of Ross Jones, in which a saturated solution of ammonium sulphate is used To a small amount of the C S F in a test tube we add an equal amount of the above solution In a normal fluid after the mixture has been allowed to stand for three minutes you will see a faint trace of opalescence If there is an increase in globulin you find a marked opalescence or definite turbidity This test may also be carried out by adding the ammonium sulphate solution carefully so as to form a layer on the top of the C S F a white ring at the junction of the two liquids indicates a positive reaction Another test which besides the above we carry out as a routine in the laboratory is Pandy's In this a saturated solution of carbolic acid in distilled water is used The test is a very

simple one. One c c of the reagent is put into a small test tube and a drop of the fluid under examination is added by means of a pipette. In a normal fluid nothing happens or the faintest trace of opalescence is seen. If globulin is increased you see in the course of the drop as it falls a white spiral cloud.

The test for sugar, as far as our present knowledge goes, affords little information of any importance in diagnosis. It is absent as a general rule in inflammatory conditions of the meninges, and if the test for it is negative it will be a further indication of the condition.

*Colloidal Gold Test.*—The colloidal gold (C G) test may be considered here under the chemical examination of the fluid, as it is really a measure of the protein content of the fluid. We have only recently commenced to use this method of diagnosis in the laboratory, as I considered that we had ample methods already in use to meet all cases, and the test—the value of which is still doubtful and which depends on colour readings—is a difficult one to carry out properly. The preparation of the reagents requires the greatest care, and you may have to make up several samples of the gold solution before you obtain one of the right transparency. The test was introduced by Lange in 1912, and the principle depends on the fact that protein in a fluid in the presence of sodium chloride will lead to decolorization of a colloidal gold solution. This decolorization is seen in varying degrees according to the amount of gold precipitated, and is shown in the test in colours varying from white or complete decolorization through shades of blue and lilac to the normal rose red in which no precipitation and no decolorization has taken place.

*The Test.*—Eleven test tubes are placed in a rack, to the first is added 1·8 c c. of 0·4 per cent. saline, and to each of the others 1 c c. To the first tube you then add 0·2 c c. of the C S F. to be examined, this gives a 1 in 10 dilution of C S F., 1 c c. from No. 1 tube is then added to No. 2 tube = 1 in 20 dilution. 1 c c. from No. 2 to No. 3 = 1 in 40, and so on to the tube No. 10 which has the C S F. in dilution of 1 in 5,120. No. 11 tube has saline only. Now add to each tube 5 c c. of the colloidal gold reagent and allow to stand overnight at room temperature. If all the tubes still show the rose or salmon red colour of the control the reaction is negative, no decolorization has taken place. If the result is positive it is stated in terms of the colour changes varying from a bluish tinge in the red through lilac to complete decolorization. The colour changes seen in each tube are indicated by numbers. The normal red colour—0, red-blue—1, lilac—2, blue—3, blue grey—4, white or colourless—5. A negative result would read 0000000000, and be represented on a diagram for plotting purposes as a straight line indicating that no change had taken place in any of the tubes.

Three varieties of a positive reaction are described:—

(1) Meningitic (non syphilitic), where the maximum colour changes are in the higher dilutions and the reading would be approximately 0011234432, the numbers indicating the colour in each tube from 1 to 10.

(ii) Luetic Seen in tabes dorsalis and cerebro spinal syphilis, where the maximum decolorization is in the region of the third, fourth and fifth tubes, the result would read 1223320000

(iii) Paretic In general paralysis of the insane where the highest decolorization is met with and the maximum changes are seen in the first four to eight tubes A paretic curve would read 5555431000 Opinions on this means of diagnosis are varied A recent authority still places the gold test after the Wassermann and globulin tests of the C.S F in estimating its value in diagnosis The writer has not yet had sufficient experience in its use to attest its relative importance, but from a study of the most recent literature it would appear that the test is one of some value in suspected cases of neuro-syphilis and it is now one of our routine tests in the laboratory It is often found to be positive in cases which clinically are neuro syphilis, but in which the Wassermann test in the C S F still gives a negative result and it is frequently the first indication that a patient is suffering from cerebral syphilis In a recent paper embodying the results of the examination in about 200 cases Lynch, Fry, and Worster Drought [1] come to the following conclusions —

(i) A positive gold reaction in the C S F is definite evidence of organic nervous disease

(ii) In syphilis of the central nervous system a positive C G reaction appears at an earlier date than the Wassermann reaction

(iii) Although dementia paralytica is usually associated with the paretic type of curve and tabes dorsalis with a luetic type, definite exceptions occur, it is probable that the type of curve varies with the intensity of infection of the central nervous system rather than with the clinical type of the disease

(iv) Anti syphilitic treatment on modern lines tends to modify and may even abolish a positive C G curve

(v) Disseminated sclerosis is associated with a positive curve the type of which varies with the intensity and stage of the disease

From the above it is evident that you cannot rely too much on the exact nature of your positive curve in arriving at a definite diagnosis and modifications of the three so called diagnostic curves may be found to be necessary In two cases of dementia paralytica with Wassermann test positive in the cerebro-spinal fluid recently examined in the laboratory the colloidal gold curves were paretic in type and in one case diagnosed as neuro syphilis also with a positive Wassermann test in the cerebro spinal fluid, the curve was luetic, but in none of the cases did the curve correspond very closely with the orthodox types The test has never been found to be positive in cases of so called functional brain disease In the paper which has been already referred to the writers found the test positive in four cases only out of thirty patients suffering from organic nervous disease other than neuro-syphilis and disseminated sclerosis

Urea —Another chemical test of the cerebro spinal fluid which may be of great value in diagnosis in doubtful cerebral cases is the estimation of

ness In health the fluid contains a small trace albumin 0 04 per cent In meningitis the albumin is increased and may be as high as 0 4 per cent This may be estimated by the nitric acid method using 5 c c of the cerebro spinal fluid

A group of changes in the cerebro spinal fluid known as Froin's syndrome which may be of value in diagnosis may be mentioned here When present it means spinal tumour or intraspinal inflammation leading to a blockage of the spinal subarachnoid space with isolation of the part below the obstruction When this condition which is sometimes known as loculation occurs the fluid is generally (i) clear yellow in colour (xanthochromia) (ii) coagulates spontaneously due to great increase in fibrin (iii) shows a large increase in globulin

(c) *Cytology*—An examination of the cellular elements present is one of the most important in the routine examination of the C S F An increase in the number of cells occurs in all inflammatory conditions of the meninges But as will be seen in some very definite pathological conditions this increase may be very small and approach closely to the normal it is necessary therefore first of all to make a cell count This is done exactly in the same way as you do a white cell count, using the field method with the exception that no dilution of the C S F is necessary A drop of the cerebro spinal fluid, previously well shaken, is placed on the haemocytometer slide in the usual way and it is quite unnecessary to use any staining medium A portion of the C S F under examination is then centrifugalized and a smear of the sediment made on a slide and stained with Leishman so that the varieties of cells present and the percentage of each may be determined Very definite information is obtained by this examination (i) In pyogenic infections of the meninges *e g* cerebro spinal meningitis pneumococcal and streptococcal meningitis, the polymorphs are the predominating cells and may reach 100 per cent of the total (ii) In tuberculous meningitis and in syphilitic meningitis also in polioencephalitis, the cells are nearly all lymphocytes But this will be considered more fully under the diagnosis of individual diseases

(d) *Bacteriology*—The bacteriological examination of the C S F frequently clinches the diagnosis We examine the deposit (obtained after centrifugalizing) for organisms by staining with Gram's method, or if the fluid is thick and turbid without centrifugalizing By this direct examination the organisms can sometimes be found without proceeding further but further examination is nearly always necessary, and this consists in inoculating various media from the centrifugalized deposit and the determination of any resulting organismal growths The causative organism in a case of meningitis may be one of the following —

Meningococcus

Pneumococcus Causing a primary meningitis or one secondary to a pneumococcal septicæmia or pneumonia

Streptococcus

Staphylococcus [illegible] extension from disease of cranium or middle ear

Gonococcus Rare

Tubercle bacillus *B typhosus B influenzæ B anthracis* all rare

*The Wassermann Test*—This affords information of great value The examination is carried out as in the blood with the exception that the cerebro-spinal fluid which does not contain complements is not heated beforehand

Some of the most important changes in the cerebro-spinal fluid which are found in various pathological conditions have already been indicated but we must examine more closely the various diagnostic points present in the more important diseases The fact that meningitis is present is in a large number of cases clinically definite but an examination of the cerebro spinal fluid is necessary to ascertain its cause It is also necessary to exclude meningismus—that condition of meningeal irritation occurring *e g* in pneumonia or typhoid fever—which gives rise to symptoms clinically indistinguishable from a true meningitis A lesion of the meninges must be present to cause changes in the C S F other than changes in pressure and the amount

*Cerebro-spinal Meningitis*—The pressure and the amount of the C S F are as a rule both increased, and frequently as much as 30 c c can be drawn off before the normal pressure is reached

Naked eye Appearances—The fluid is turbid This turbidity may be very slight early in the disease and varying degrees up to a frankly purulent fluid may be seen It should be remembered here that the C S F may be quite clear during remissions in the disease Flakes of protein material or fibrin are commonly seen floating in the fluid Albumin is markedly increased and the fluid on boiling may become solid The globulin test is positive Fehling's solution is as a rule not reduced

Cytology—There is a large increase in the number of cells present due mostly to the polymorphs, which may be 100 per cent of the total cell content Later in the disease in cases which are recovering the turbidity clears and we find that the lymphocytes are increased In most cases the causal agent, the meningococcus—a Gram negative diplococcus often intracellular—can be found in the stained film without using cultural methods but cases are met with in which the organism cannot be demonstrated in this way and in these the fluid must be plated out on one of the special media which are used for the meningococcus

In the various other forms of septic meningitis, such as streptococcal influenzal, pneumococcal typhoid and gonococcal the pressure amount chemical character and cytology are altered as we have seen in cerebro spinal meningitis, and it is only by the isolation of the causative organism that a definite diagnosis can be made

*Tuberculous Meningitis*—The pressure and the amount are, as a rule, markedly increased The fluid is clear or faintly turbid When allowed

to stand for some hours a clot of fibrin forms, and in this the tubercle bacillus can frequently be demonstrated on the stained film. Cytological examination shows a marked increase in the number of cells which are nearly all lymphocytes. The globulin test is positive.

*Acute Poliomyelitis and Polio-encephalitis.*—This condition, also known as Heine-Medin disease, is really a meningo-myelo-encephalitis, as the meninges are practically always involved. The C.S.F. is clear but the pressure and amount are usually slightly increased. The cells are increased in number and consist largely of lymphocytes. The globulin test is positive, and Lehlunge solution is generally reduced. In meningismus or meningism, as has already been indicated, the pressure and amount may be increased but the globulin test is negative and there is little or no increase in the cells.

*Cerebral Tumour and Cerebral Hæmorrhage.*—When these are deep-seated so that there is little or no involvement of the meninges, we find the fluid clear and under increased pressure, but the changes indicating inflammatory trouble such as an increase in the cells and in the globulin are absent.

*Encephalitis Lethargica.*—The examination of the C.S.F. in suspected cases of this disease does not help us much in diagnosis, except by excluding other cerebral affections. It is stated that in the early stages of the disease an increase in the lymphocytes, protein content and sugar may be found.

*Trypanosomiasis.*—In this disease we find an increase in the cells very similar to that met with in cerebral syphilis. The globulin test is positive and the parasite may be found in the centrifugalized deposit.

*Disseminated Sclerosis.*—Also known as multiple and insular sclerosis. Some forms of cerebral and spinal syphilis may simulate this disease very closely, and as we have seen when speaking of the colloidal gold test, patients with disseminated sclerosis give a positive result in a large percentage of cases. The curve is usually luetic in type. Cerebral syphilis can, however, be excluded if the Wassermann and globulin tests are negative and there is no increase in cells.

*Syphilis of the Central Nervous System.*—We now come to consider the pathology of the C.S.F. in affections of the central nervous system due to syphilis. This is a very important subject and fortunately an examination of the fluid in these cases will even at an early stage of the disease, often be of the greatest value, and in many will at once settle the diagnosis. The changes in the C.S.F. are very definite and very constant, and it may be said that in no other affection of the central nervous system does lumbar puncture yield such valuable information. It is well to have a clear understanding of the nature of the lesions in the brain and spinal cord, which may result from syphilitic infection. These lesions are so varied that a good classification of them is not easy. One of the best which the writer has seen and the most comprehensive is that suggested by Head, MacIntosh and Fildes, which is quoted from a paper in this journal [2] by Carhill, Fildes and Baker. It is as follows:—

(*A*) Secondary syphilis of the nervous system—meningo vascular
(*B*) Tertiary syphilis of the nervous system
(1) Meningo-vascular
(2) Syphilis centralis
(*a*) Tabes dorsalis
(*b*) Dementia paralytica
(*c*) Tabo paresis
(*d*) Syphilitic muscular atrophy

Secondary meningo vascular syphilis includes those cases of meningeal affection, frequently acute in character, in which the most prominent symptom is headache It also includes affections of the cranial nerves, often transient in character secondary to a localized meningitis The more frequent use of lumbar puncture as an aid to diagnosis has shown that secondary meningo vascular syphilis is much more common than was formerly thought, but many of the cases in which the only symptom present may be headache are still not recognized The great importance of an examination of the C S F in all cases of chronic headache, whether there is a history of syphilis or not, cannot be too strongly emphasized

Tertiary meningo vascular syphilis includes what is sometimes called the interstitial type, and comprises the various forms of the disease often referred to as cerebro spinal syphilis A large percentage of all cases of syphilis of the central nervous system fall under this heading including as it does those cases so commonly seen of thrombosis and hæmorrhage due to syphilitic endarteritis also affections of the cranial nerves due to meningitis

In syphilis centralis the parenchymatous tissue is the main seat of the syphilitic lesion, although some degree of meningitis is also frequently present It includes the so called para-syphilitic diseases—tabes dorsalis dementia paralytica, tabo paresis, and the less common but clinically distinct syphilitic muscular atrophy

Speaking generally we find in the various syphilitic affections of the central nervous system that —

(1) The C S F is quite clear
(2) There is a moderate increase in the pressure and the amount
(3) The globulin test is positive
(4) There is a moderate, often very slight increase in the number of cells which consist largely of lymphocytes
(5) The Wassermann test is positive
(6) The colloidal gold test is positive

The increase in cells is very different from that met with in the various forms of septic meningitis where many thousands may be found in a cubic millimetre. In syphilitic disease the count may be only a little above the normal which is not more than five If ten cells or more are present the condition is definitely pathological, and the larger the number of cells found the greater the extent of the meningitis present The number of

[illegible] [illegible] [illegible] [

referred to, I would add that attention had been called to this fact. Excluding the cases of syphilis, then which may occur in a syphilitic patient, and when the readily diagnosed a positive W.R. in the C.S.F. indicates syphilis of the central nervous system.

The colloidal gold test has already been considered. Compared with the Wassermann test, it can only be looked upon like the globulin test as a useful adjunct in the diagnosis of syphilis. As we have seen, some help may be obtained by its use in differentiating the various forms of cerebral syphilis, but as far as our present knowledge goes, too much reliance cannot be placed on the three types of colour curves which have been described. It has to be remembered also that it gives a positive result in practically all cases of disseminated sclerosis, and may be positive in other non-syphilitic affections of the central nervous system.

REFERENCES.

[1] The *Lancet*, November 18, 1922.
[2] JOURNAL OF THE ROYAL NAVAL MEDICAL SERVICE, October 1917.

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## THE CARRIER PROBLEM[1]

BY SURGEON COMMANDER S. F. DUDLEY, O.B.E., M.D., D.P.H., D.T.M., R.N.

I HAVE chosen this subject because I think it of vital importance to all workers in preventive medicine, and also because, by force of circumstances, "carrier hunting" has formed a large proportion of my duty during the last ten years. The subject is especially worthy of consideration by this group of the Society, as in the Services where large bodies of men live closely together in ships and barracks, the carrier question often becomes acute. In the Services too the population is more under control and therefore Naval and Military doctors have better opportunities for studying the carrier state in its epidemiological aspect than their civilian colleagues.

It has frequently been pointed out that the knowledge of how to prevent many diseases which are still only too common, is in our possession but public opinion is, as yet, not sufficiently educated to allow preventive medicine to use to full advantage the truths she has wrung from Nature. Nearly all those parasites that spread disease by the alvine discharges, by insects, or by direct contact could be controlled as, for example the parasitic causes of enteric fever, yellow fever and syphilis.

There remains however a great group of diseases that, even if preventive medicine had a free hand, it could, at present, do little to control

[1] Read at a Meeting of the Naval, Military and Air Force Group of the Society of Medical Officers of Health on June 9, 1922, and reprinted from *Public Health* by kind permission of the Society.

These are those infections which invade via the respiratory tract and are usually spread from person to person by means of droplet infection. The best if most hackneyed, example of this type is epidemic influenza.

When the nature of infectious disease was understood, arrangements were made to isolate infectious patients, and it was hoped early isolation would greatly diminish the incidence of zymotic diseases. To a certain extent this isolation may, nay must, have had some effect, however small, in diminishing the number of those infections, but on the whole the results have been very disappointing. Why is this? One reason, and probably the chief reason, is that all diseases, almost without exception, are accompanied by more or less numerous carriers.

What is a carrier? I think the best definition for our purpose is —

A carrier is any individual who, while presenting no marked symptoms of disease, harbours a parasite capable of producing a recognizable disease in certain susceptible people.

For convenience carriers can be divided into four groups —

(1) Precocious, (2) contact, (3) convalescent, and (4) chronic.

*The Precocious Carrier.*—This class of carrier, also known as the incubation carrier, has been the least studied. Just lately Dr Fletcher [1] of Kuala Lumpur, reports that three men were accidentally fed with paratyphoid bacilli. In two of the cases he recovered the organism from their stools within a fortnight, three and nine days respectively before symptoms of paratyphoid fever developed. The third case discharged bacilli for some time, but never developed clinical symptoms. Those two cases furnish undoubted proof that it is possible for a case of paratyphoid fever to be dangerous during the incubation period, and are important, as I know of no other such definitely proved examples in other diseases. Ledingham [2] mentions in his book similar cases of precocious carrying of *Bacillus typhosus*.

On the whole there is little evidence to be found in the literature showing that infectious diseases can be spread during the incubation period. Measles is infective very early, but in the absence of a known biological cause it is hard to prove definite infectivity before the onset of symptoms. During the incubation period the organisms must be in the patient and multiplying somewhere, but it almost seems that by the time they are numerous enough to be found by the bacteriologist they will either have produced symptoms or the carrier state. A corollary of the rarity of demonstrating precocious carrying is the observation that discovered carriers very seldom develop the diseases they carry. For example, among thousands of meningococcus carriers there is scarcely an authenticated case of one of them developing meningitis. Yet if precocious carrying were common, many instances would surely have occurred. Auto-infection of a carrier is, after all, not to be expected, as in order to be a carrier he must have a high degree of resistance to the parasite he harbours. Many cases of so-called auto-infection may well be due to reinfection with

a different variant of the same parasite, while others will not bear severe criticism

The precocious carrier is interesting, but probably not very important in most infectious diseases Before leaving this type there are one or two interesting observations on syphilis I think worth examining It has been reported [3] that (1) the seminal discharges from apparently cured syphilitics are infectious and (2) in rabbits *Spironema pallidum* can be found in the lymph nodes within forty-eight hours of experimental inoculation [4] Combining these two reports it is possible that the seminal discharges of a man may be infective before the appearance of any chancre that is to say a factor in the spread of syphilis may perhaps, be the precocious carrier It is only fair to add, however that Noguchi [5], still more recently, reports that he found spironemes similar to *S pallidum* in 30 per cent of a batch of apparently normal rabbits he examined This rather discounts the previous observation unless confirmatory work shows the rabbits used are free from spironemes before experimental infection Still, to my mind it has almost seemed essential that syphilis must often be conveyed by males without any obvious lesions, that is to say, by carriers

Let us now consider the so-called contact carrier If a textbook on infectious diseases is referred to, the clinical types of an infection are almost invariably divided up as follows Ambulant, mild, severe and fulminating This indicates that there are gradations in the signs by which we recognize a disease—from a patient so little disturbed as to be walking about, to the man suddenly struck down by a rapidly fatal illness Yet this gradation of infection is not complete from a bacteriological point of view There is a yet milder form of infection which in many parasitic conditions is the commonest of all types It is the contact carrier Therefore, to complete our classification of types of parasitic infection, we must insert ' carrier and read— carrier, ambulant, mild &c

Because the carrier cannot be recognized without a bacteriological examination his frequency and importance are not as clearly realized as he deserves The contact carrier is presumably called ' contact because he is usually discovered among those who have been in contact with an infectious disease As a matter of fact he may be responsible for the patient or the latter may be responsible for him The mildest type of infection is the carrier state which usually runs its course just as the obvious disease does The contact carrier responds to infection in many cases by producing recognizable immunity substances in his blood and he throws off the infection in a comparatively short time only, in his case, the outward and visible signs, such as fever or a rash, are absent Meningococcic infections demonstrate the relation of the contact carrier to actual illness During cerebro-spinal fever epidemics there are hundreds of people who harbour organisms in the naso pharynx, indistinguishable from meningococci, which are the presumed cause of dangerous meningitis Undoubtedly the common form of meningococcal infection is an insig-

nificant [illegible] meningitis being a rare type of [illegible] infection It is interesting to note the analogy with the gonococcus a closely related organism which causes a severe catarrh but in a different locality, with septicæmia and meningitis, rare but not unknown types of infection

We now come to the "convalescent carrier," who is the case of disease who does not lose his parasite with his symptoms but takes it with him into convalescence This type of carrier is responsible for the return cases of the fever hospitals and is a large factor in the spread of epidemics

Finally if a contact or convalescent carrier remain infectious over a long period for convenience generally fixed at three months, they become chronic carriers The chronic carrier may or may not give a history of a specific disease according as he originates from a convalescent or a contact carrier The chronic carrier is of great importance, as he is often the link which connects one epidemic to the next and who is responsible for the peculiar appearance of sporadic cases distributed in time and space without any apparent relation to other cases of the same nature

The chronic carrier may be a dangerous source of infection for years or even life He is an instance of a permanent mutual adaptation between two organisms—man and a pathogenic bacterium

As an example of the chronic carrier at work let me relate a naval experience [6] We will start with three apparently unconnected events First during the year 1900 a ship serving in the China Seas returns a few cases of typhoid fever Secondly, after a lapse of nine years a ship based on Gibraltar reports half a dozen cases of typhoid fever Finally in 1911 a battleship in Home waters returns many cases of typhoid fever Casually it looks extremely unlikely that these three typhoid outbreaks separated so widely in time and space can have anything to do with each other The only point they possessed in common is that the ships medical officers writing at the time of the occurrence of the cases were at a loss to explain them and even commented on the absence of typhoid fever in the rest of the squadron However, this is the explanation In 1898 a ship's cooper was sick in Chatham Hospital with typhoid fever He returned to the same hospital in 1914 and was found to be carrying *B typhosus* Between these two visits to Chatham Hospital he served in twelve ships and established in every one of which returned cases of typhoid fever (fifty-three in all) during the time of this man's service The outbreaks with which I started this story were undoubtedly his fault I know of no better example than this of the manner in which epidemics and sporadic cases of disease may be linked together in time and space by the chronic carrier

The foregoing remarks attempt to summarize the relations of the different types of carrier state to the definite diseases whose germs they carry

The practical discovery of carriers is the next question that demands attention First there is the selection of cases most likely to be carriers

such as people with a history of the disease in question, disease contacts, known carrier contacts, people with catarrhs, chronic discharges, and those who deal with food. This is all common-sense public health administration, and I will not dwell on it. The suspects being obtained, the onus of proving them guilty of carrying pests with the bacteriologist. Most medical men, even if not technical bacteriologists, realize by this time that the difficulty of distinguishing dangerous micro-organisms from the numerous similar harmless ones, invariably in the same environment, is by no means an easy task, even in marked cases of illness. The task becomes even of greater difficulty in the case of carriers, and unless great care is taken mistakes must be frequent. The diphtheria swabbing controversy is a good illustration of this difficulty. To a great extent it is a matter of personal equation what a morphological K. L. B. looks like. Yet I think as one gets more experience the atoxic diphtheroid bacilli returned as possible K. L. B. become less and less. But every bacteriologist must admit there still remain many atoxic diphtheroids indistinguishable from true *B. diphtheriæ* except by an animal experiment. And all carrier statistics as regards diphtheria are absolutely useless unless the organism has been isolated and tested on a guinea-pig. With meningococci the poor bacteriologist is in just as great a predicament as with diphtheria. Those who studied technical bacteriological literature at the time of the cerebro-spinal fever epidemics must have realized that the question, What is a meningococcus? was as strenuously contested in the laboratories as questions such as, What is a sardine? were debated in the law courts.

The difficulty of distinguishing harmless organisms from dangerous ones resembling them is so important that I make no apology for introducing a third example—*B. influenzæ*. *B. influenzæ* is a group of organisms very hard to grow on artificial media, but if a suitable medium is used it can be found in half the population. I think I may claim to be among the first to point this out [4]. It may or may not be the cause of epidemic influenza. But it is an extremely variable organism both in its morphology and serological reactions. Maitland and Cameron [5] recently isolated thirty-eight strains, nearly all of which showed a different serological individuality and varying strains could be obtained from the same person. From my point of view this plasticity is a great point in favour of Pfeiffer's bacillus being the specific cause of influenza. From the more conservative point of view the fact that it is so ubiquitous in healthy throats militates against its pathogenicity. If one of this group, known as Pfeiffer's bacillus or *B. influenzæ* causes 'flu, the numerous carriers and the variability of the group explain the epidemiology of epidemic influenza straight away.

The crux of the whole problem is the fact that it is impossible to differentiate the pathogenic organisms on morphology only. Systematic biologists, without exception, prefer to diagnose species by morphological

rather than fundamental characters, the latter being highly variable and reactionally to every change of environment.

Owing to the simplicity and lack of obvious structure in the bacteria, biochemical and serological reactions are chiefly depended on for specific differentiation, and thus characters are functional and therefore very plastic. From the medical point of view the characters of virulence and infectivity are the most important; they are probably the most recently acquired and therefore the most variable, and anyhow the hardest to define or detect by present day methods. None of the reactions of the pathogenic bacteria, taken as a whole, is fixed, or correlated with the power of producing disease. For instance Bell [9] has demonstrated that the serological groups of the diphtheria bacillus show no relation to their power of producing toxin. *B. abortus* is non pathogenic to man, yet it is said to be indistinguishable serologically or by any other means, from *Micrococcus melitensis*, except that the latter is more harmful to rabbits [10].

For most practical purposes an experienced bacteriologist will make few mistakes if he is given time, but here again the time taken to return a report must be reduced as much as possible or, however accurate the findings may be, they will be too late to be of much service to the clinician or administrator. The correct diagnosis of the organism is essential in examining carriers, as it often means curtailment of liberty or loss of employment to a strong healthy individual. On the other hand, a negative result does not necessarily mean that a man is not a carrier, because the more efficient the technique the greater the number of carriers found. For example suitable media must be used, as was well shown in the influenza prevalence and accounted for many discordant reports of the presence or absence of *B. influenzæ* in patients or others. In looking for *B. influenzæ* one may use a medium on which stock laboratory strains will grow well and never find one specific bacillus, whereas with suitable technique *B. influenzæ* can be isolated from 50 per cent of some samples of the population.

In diphtheria swabbing, too, I have tried many media on which pure cultures of K L B may grow much more luxuriantly than on coagulated ox serum, but, in my hands, the latter is the best for primary cultures from the throat. It is the only one I have used where K L B is very rarely outgrown by other bacteria and, when present, is in most cases the predominant organism, at any rate in the cases of clinical diphtheritic throats. For instance, from among seventy-five cases of diphtheria seventy-two typical morphological diphtheria bacilli were found easily, though in most cases the bacteriologist did not know whether he was dealing with a case or a contact, and only found 4 per cent carriers among over 1,500 swabs. In the diphtheria carrier state I must confess the bacilli are not always as easy to find. Still many carriers show cultures as profuse as those from cases, and probably these are the dangerous ones.

Suppose the technical difficulties just indicated are non existent, there

[illegible] important [illegible] to answer viz. [illegible] is [illegible] from carriers [illegible] how often must it be examined? This [illegible] the big but apparently often little [illegible] [illegible] in [illegible] examination [illegible] carriers.

During the recent epidemic I did a few special [illegible] swabbings on the same batches of men at short intervals and [illegible] the following conclusions. Suppose ten carriers are found among [illegible] hundred men and segregated. Examine the other ninety in a few days and probably five more carriers will appear. A few days later again and further carriers will be found among the eighty five negatives left. Meanwhile the carriers first isolated are clearing up. Therefore it seems quite possible that during the epidemic the majority of the original 100 man at one or more times are infected. In other words the wave of incidence and cure of carriers passes over the population in a lash in analogous to the epidemic wave of actual cases. The actual proportion of carriers to cases may vary enormously with different infections and different variants of the same infection. As regards C S M carriers I came to the conclusion that the only way to keep the Royal Navy free from them would be to swab the whole personnel every morning and retire the report by noon as any man may become a carrier on the morrow of the day the examination is negative.

Intermitting or relapsing chronic carriers are another difficulty. Enteric carriers have been most studied on this point. Ledingham [2] mentions intervals in the discharge of *B typhosus* ranging from weeks to years. In the naval carrier previously referred to in ten examinations out of eighteen I was unable to demonstrate typhoid bacilli in his stools. This same carrier also illustrates how the presence of immunity bodies in the blood may help in searching out a carrier. This man's blood was the only one among some fifty men to give a positive Widal reaction. For this reason the examination of his stools was twice repeated before a positive result was obtained. Unfortunately all carriers do not produce recognizable immunity bodies.

Here is an instance which suggests an intermittent carrier. While investigating an unexplained outbreak of typhoid at a naval air station I came across an immunized cook whose blood agglutinated *B typhosus* in dilutions as high as 1 1 000. In spite of repeated efforts no enteric organisms were ever recovered from his discharges. He had no history of any disease resembling enteric fever. No further cases of typhoid occurred after his removal from the air station galley. This incident suggests that the cook with the strong Widal reaction was a carrier examined in a free interval.

When we consider these cases and also remember that probably over a third of enteric carriers do not give specific agglutination reactions we realize what a real trouble intermittency may be. Intermittency is also seen in the respiratory group of organisms, such as those of diphtheria meningitis and pneumonia.

In [illegible] control of [illegible] by the isolation of [illegible] by the [illegible] of fresh contents [illegible] of chemical [illegible] and bacteriological [illegible] but the [illegible] as a public health [illegible] swabbing, but thoroughly [illegible] and repeatedly may [illegible] in an institution where the [illegible] not too unwieldy but [illegible] in the case of an epidemic will [illegible] way among large bodies [illegible] promiscuous swabbing by a few already overworked bacteriologists [illegible] hopeless procedure To make any impression the numbers [illegible] to be examined becomes so large and the examinations [illegible] with frequent repetition as to make swabbing an impractical proposition [illegible] The most swabbing can do is to flatten the curve of incidence [illegible] at the same time prolonging it In plainer language though [illegible] number of cases in the epidemic is not diminished they are spread [illegible] interval of time by the segregation of some of the sources [illegible] in the shape of those carriers found I think I have an example [illegible] in a comparison of the scarlet fever and diphtheria incidence at Greenwich School In six months there were 100 cases of diphtheria [illegible] fairly evenly All this time carriers and sore throats not [illegible] diphtheria but containing diphtheria bacilli were being found and [illegible] In the midst of this period 129 cases of scarlet fever [illegible] but the majority occurred during six weeks instead [illegible] six months During this period the number of sore throats, negative [illegible] *B. diphtheriæ* increased many of which were probably abortive [illegible] cases *i.e.*, scarlet fever carriers, but luckily for the bacteriologist [illegible] cannot detect these latter yet Thus the result of removing the diphtheria carriers and not the scarlet fever carriers was one of the facts which [illegible] the diphtheria to last four times as long as the scarlet fever I do not mean to say there are not other factors in fact I think there are more important ones in this case, but I cannot touch on them here.

A few remarks must now be made on the danger of infection from carriers It is undoubtedly a fact that many carriers of real pathogenic micro-organisms seem to be perfectly harmless, so much so that some people scoff at the whole question of carrier infection, and go back to the ancient view that the fact of an organism being found in healthy people is proof in itself that it is not pathogenic However, to most minds this proposition is no longer tenable In some diseases as for example diphtheria we actually know why the carrier is immune by finding antitoxin in his blood

Certain carriers may be harmless because Firstly the parasite, though pathogenic by our tests has adapted itself to the carrier state and produces carriers rather than cases of disease

Secondly, the concentration of the organism in its host's discharges may be too low for the germ to be sprayed about in doses sufficient to

[illegible] the local carrier hunting rather supports the idea as it [illegible] seems always more difficult to isolate pathogenic [illegible] than from the actual case of disease. If [illegible] it means that the carrier must be detected and [illegible] harmless one.

The [illegible] of the man in question. The man had [illegible] splashing, is in simple [illegible] dangerous habit, and [illegible] that practically only those [illegible] who handle [illegible] In the case in question there is the [illegible] of stealing [illegible] which had [illegible] through [illegible] Though [illegible] harmless [illegible] dangerous. A [illegible] gets a cattle [illegible] chance to multiply to a danger [illegible] either become [illegible] way of means. [illegible] because of the [illegible] habit of the host or perhaps [illegible] accumulations until the [illegible] microbes. The little [illegible] consing cough [illegible] the carrier germ in it [illegible]

During the [illegible] diphtheria and [illegible] Naval Sick [illegible] harbour [illegible] seven of [illegible] cases of scarlet fever [illegible] suspicion of [illegible] diphtheria. In [illegible] tested [illegible] virulent. [illegible] diphtheria [illegible] Schick [illegible] of the [illegible] the scarlet [illegible] diphtheria [illegible] harmless [illegible] which [illegible] multiplying [illegible] In this connection [illegible] stimulation [illegible] tion between *B. diphtheriae* and [illegible] generally found in the throats of [illegible]

It is now possible to suggest the [illegible] sider it a useless procedure to send diphtheria [illegible] charge from hospital [illegible] retain cases. From scarlet fever [illegible] diate circle it is quite likely the latter may be [illegible] infection is brought [illegible] cases before his return [illegible] diphtheria. In many instances the diphtheria in the Schick test has shown this to be the case. Again, a carrier [illegible] school or institution [illegible] only adds one more to the [illegible] already there, and should [illegible] cases is more likely to do so than [illegible] diphtheria indirectly than one or more contact carriers than directly. Why do I say this? Consider a school like that at Greenwich. [illegible] six days out of seven have no [illegible] School

[illegible] they are incapable of developing diphtheria but it does not mean that they are incapable of becoming carriers A diphtheria carrier in the midst of such a population has a six to one chance of infecting an immune boy as a carrier and only a one to six chance of directly infecting a susceptible, that is of directly causing a case of diphtheria It is thus often hard to bring home the guilt to the convalescent carrier primarily responsible for in it may be linked by a chain of contact carriers to the case of which he is the cause

The actual danger of carriers is sometimes hard to prove directly The case against carriers may be said to be definitely proved in the enteric group and in diphtheria In the case of cerebro spinal fever it was hard to obtain actual proof of the danger of any individual carrier However here is an observation from my own experience A case of C S M occurred in Chatham Among his immediate contacts no carrier was found but there was one contact missing, a great friend of the patient, who had gone on four days leave to visit his family three days previous to the onset of the patient's illness On his return he was swabbed An almost pure culture of meningococci was obtained from his naso pharynx Two days after his return his wife and child simultaneously developed meningitis This man carried meningococci for some months He I think must have undoubtedly been a dangerous carrier As again emphasizing the importance of contamination of an infective virus in the respiratory discharge as a factor in the danger from certain carriers I would note that I remember few other instances where meningococci were obtainable in such profuse quantity and in such purity of culture as in this case Again in H M Hospital Ship *Iguan* in 1918, when C S M cases had become very scarce I found two carriers—contacts of different cases In one case there were two previous entries on his papers of his having been detained in 1915 and 1916 as a carrier, the other also had spent some months in hospital previously as a carrier Perchance these were dangerous intermitting chronic carriers of meningitis and may have infected cases in 1915 and 1916 and have been the cause of the two cases in 1918 On the other hand, they may have merely been similar to people with a chronic relapsing catarrh, always due to the same organism, and the meningococci they carried may have been quite harmless

The last difficulty I will mention very briefly Even if it were possible to discover all disease carriers, can they be segregated? In this connection it is well to listen to the protests from the fever hospitals during epidemics when they find their beds filled with healthy people while those who are really sick are clamouring for admission Even suppose the beds were available can we imprison chronic carriers for life if we cannot cure them? The cure of chronic carriers seems almost hopeless As Sir William Andrews pointed out to this Society, this is not surprising they are immune Carriers have formed a compromise with a usually pathogenic organism that they will give it shelter as a saprophyte provided it invades no farther

[illegible] even if we think we have cured a chronic [illegible] In some work done in India it was found that th[illegible] to have been cured of simple carrying, were reinf[illegible] on after they returned to active service conditions [illegible] surgical measures may effect a cure, such as the removal [illegible] adenoids from diphtheria carriers or the gall bladder f[illegible] But outside surgery no other measures seem of much [illegible] The typhoid carrier illustrates all these difficulties He may [illegible] morning drop or not even that—only a few pus cells [illegible] prostatic sugar Outside surgical measures, efforts to cure him with vaccines or lotions are almost hopeless There are no reliable tests of time and a negative bacteriological examination is no guarantee whatever against relapse

You will have noticed that practically all my examples of carriers relate to diphtheria cerebro spinal meningitis or the enteric group This does not mean that carriers are any less important in other diseases but in the three selected diseases each has well known and studied organisms in relation to them accepted by most people as playing the principal rôle in the aetiology of these fevers In many other diseases the carrier is one of the most important agents in dispersal, even though as yet we may be doubtful of what the actual thing is he disperses and have no means whatever of recognizing him There is no hypothesis that can explain the epidemiology of encephalitis lethargica better than the carrier one Allow there are carriers of it and the peculiar distribution is simply explained In infantile paralysis carriers of a filter-passing virus have actually been demonstrated by animal experiment In scarlet fever there are some significant facts pointing to dissemination by carriers Everyone must have had experience of the peculiar, unexplained way in which sporadic cases of scarlet fever sometimes turn up In the Hospital Ship *Igadir* I kept getting odd single cases of scarlet fever without any history of contact with another case and often from ships which had given no leave for some time previously Most authorities admit that scarlet fever can occur without any rash, and apropos of this I have a rather interesting observation At Greenwich there was an epidemic of 120 cases of scarlet fever In a school there is always a certain number of boys treated for tonsillitis and sore throat I plotted out the sore throat curve of incidence and the scarlet fever curve and found that the former closely followed the latter, suggesting that many cases of simple sore throats were larval scarlet fever patients Of course, other factors favouring specific scarlet fever might also have favoured non specific sore throat Finally it should be noted that in some diseases, such as smallpox, the carrier seems an uncommon vehicle of spread, case-to-case contact being the rule But even here the carrier may account for some unexplained outbreaks like the recent one at Nottingham

Before proceeding to put forward what seem to me the most hopeful

[illegible] fact is [illegible] confined [illegible] mouth [illegible] is in the [illegible] set of [illegible] Mesan [illegible] by the [illegible] numbers of [illegible] severely or as [illegible] Hence [illegible] that the carrier [illegible] experiments on [illegible] in animals.

[illegible] occurrence [illegible] biological [illegible] the globe must [illegible] monument [illegible] sufficient [illegible] plant species [illegible] many [illegible] their [illegible]

[illegible] the spread [illegible]

[illegible] ravage to a [illegible] bation in [illegible] discharges [illegible] Another [illegible] useful in [illegible] also [illegible] A sick [illegible] carry [illegible] chance of [illegible] and isolation [illegible] which causes no [illegible] as regards [illegible] numbers [illegible] be hail [illegible] for [illegible]

[illegible] must [illegible] infectivity [illegible] but it will also depend on the concentration [illegible] in the bodily discharges. The [illegible] as the virulence of the latter

[illegible] adaptation of organisms [illegible] together. However [illegible] will [illegible] organisms [illegible] and [illegible] those [illegible] the smallest [illegible] most the least antecedent [illegible] species [illegible] increase [illegible]

3. [illegible] to parasitic [illegible] specific [illegible] lower degree [illegible] the same bacterium [illegible] pulle with no specific [illegible] the smallest of diseases [illegible] When [illegible] place the host may [illegible] third course is [illegible] and parasitic by the [illegible] that are host [illegible] the part of the host [illegible] must an immune [illegible] against [illegible] of carriers [illegible] carrier in [illegible] when the [illegible] the hosts [illegible] inflamed [illegible]

(4) [illegible] fourth important [illegible] the concentration and [illegible] the host population in [illegible] may be loaded with [illegible] by his parasitic [illegible] carrier moving from place [illegible] viewing different [illegible] many organisms [illegible] any person with the [illegible] influenza as fast as [illegible] disease will remain [illegible] with the latter world.

Briefly the more [illegible] on carriers and different [illegible] the magnitude of an epidemic [illegible] period of time varies directly as the [illegible] amount and extent of the migration [illegible] and inferior [illegible]

We [illegible] the [illegible] extent and nature of [illegible] especially [illegible] infection [illegible] factors [illegible] the organism resist[illegible] and the amount of [illegible] the hosts The immunity of a population to a certain organism gradually gets weaker and weaker circumstances [illegible] great mixing overcrowding, and movement about the world [illegible] factors favour virulence and a harmless organism varies in this [illegible] carrier becomes especially mobile and an epidemic [illegible] The susceptibles get gradually weeded out Then as concentra[illegible] [illegible] less infectivity increases virulence decreases and the invading parasite relapses to a harmless carrier state or even to the saprophytic condition it may originally have arisen from Thus with the ever changing environment the parasite changes swinging from a virulent mad killer to a harmless saprophyte and back again I personally believe this cycle is continually occurring and accounts for the waves of epidemics and the known periodic variations in the killing powers of various infections It of course must be realized that virulence and infectivity from the public health point of view are the most important properties of microbes They are the attributes that are the hardest to measure They are probably the most variable of all the varying characters of so called specific bacteria being among the latest acquired characters of microorganisms The balance of the degree of virulence of the parasite and the degree of tolerance of the host is certainly very delicate Any change of environment, such as the importation of fresh soil for the bacterial plant, as represented by another race of man, changes in climate and nutrition may will upset this unstable equilibrium At the time of the influenza epidemic all these changes of environment were more in evidence than ever before in the world's history Variants of Pfeiffer's bacillus, which ordinarily may well be a group of more or less harmless saprophytes as suggested by the multitudes that carry it may have found the necessary conditions to become a virulent scourge

The carrier state or mutual adaptation is the condition Nature strives for and if the environment remained stable this state would become permanent, but the environment continually changes and the parasites continually make and disband the experiment of pathogenicity Let us see how this theory is borne out by one or two examples from Nature

Just there is the fact that every pathogenic organism has more or less innocuous parasites resembling it which are the cause of endless trouble in detecting really virulent organisms Even in looking for anthrax in shaving brushes the final test had to be on a guinea pig as so many similar organisms of the mycoides group were present Consider the diphtheroid group, the intestinal bacteria, the streptococci—all mixtures of harmless and noxious organisms with the same habitat—surely some time in the past they were the same organism Again, which are Nature's successes as judged by population—the pathogens or the saprophytes?

How [illegible] in the world [illegible] typical bacilli [illegible] Yet [illegible] *E. coli* [illegible] environment [illegible] as an [illegible] appeal [illegible] parasites within [illegible] in [illegible] lung death of myriads of [illegible] experiment of the parasite inexorably punished by Nature. [illegible] this paradox reported by Colonel Dorgan [11] during the C. S. M. epidemic. The incidence of carriers in a certain garrison went up as the relapsing fever case rate fell. Harmless infective meningococci were establishing themselves as natural selection weeded out the disease-producing strains.

Let us, for a moment, leave the bacteria where morphology is so indefinite, and take a protozoal disease as an example. *Entamoeba histolytica* is a well defined organism with stable morphological characters easily recognized by the expert. Dobell [15] calculates that a third of the population of these islands harbours this organism. *E. histolytica* can cause a grave illness, dysentery and liver abscesses; yet though over 10,000,000 inhabitants of this island are infested, cases of these diseases contracted in England are pathological curiosities. Therefore the normal relation between man and this amoeba is one of harmless parasitism; the organism uses so little tissue as to cause no obvious injury to its host and therefore can infect a third of the population without raising man's anger against it—one of the worst things that, nowadays, can happen to any species in the struggle for existence. Conditions change; both the strains of amoeba and the strains of host belonging to different countries get mixed. The equilibrium between man and his amoeba is destroyed. The latter overdoes its invasions and produces dysentery in its host and the amoeba is ejected before it can even arrange for its dissemination—the unencysted *E. histolytica* present in acute dysentery is, of course, not infective. Or, worse still, the amoeba invades the liver where it seems unable to form cysts even should it get the chance of discharging them. Thus the parasite proceeds to commit suicide by killing its host. Again, *E. histolytica* lives in harmony with wild monkeys, but McCarrison [16] has shown, after the environment is changed by feeding with deficient diets, the harmony becomes a discord and acute amoebic dysentery ensues. This observation must mean that the carrier state is the advantageous one and that pathogenicity is the unsuccessful experiment of a species trying to colonize a fresh environment.

A final example from the plant world [17]. As you know, many plants live in symbiotic relation to fungi which serve them as roots, supplying them with salts and nitrogen in exchange for carbon compounds. The orchids all have mycorrhiza, that is, fungal roots. Orchid seeds and their infecting fungi can be separated and the latter cultivated on artificial media. The cultivated fungus, as so often happens, loses its virulence in this unaccustomed environment. If it is brought in contact with a sterile orchid seed it invades it, but the orchid embryo possesses phagocytic powers to prevent over-invasion, which totally destroy the attenuated

fungus [illegible] incidentally destroys itself as it cannot reach maturity unaided by [illegible] partner. On the other hand, it is possible to exalt the virulence [illegible] the fungus so that on invading the seed it overpowers it and completely destroys the medium. Normally in nature a perfect balance is maintained between the symbiotic fungus and the plant by means of a physiological and biochemical immunity process on the plant's part analogous to the immunity processes of the human organism which allowance is made for the absence of circulation or wandering cells in the plant. Here we have the relation between man and his parasites paralleled—unsuccessful invasion, full invasion and mutual adaptation, which last is the carrier state.

I have tried to give a brief sketch of what I believe to be the biological meaning of the relation between pathogenicity and the carrier state. I have purposely left out many difficulties in accepting this explanation without qualification. The subject of parasites and disease is much too large a subject to be dealt with in a few minutes, but in order to grasp the significance of the carrier the subject must be viewed from a biological standpoint.

Let us now turn to the practical aspect and ask: What is the best method of attack on the problem of the carrier in prevent outbreaks of those especially of the infectious spread by the fecal infection? We have seen that the carrier is in the majority of epidemics—the more crowded the population, and the amount of movement of population. The last factor is of the utmost importance but public health officers cannot do anything in it. Up to the present work has been for the most part concentrated on the first factor, the incubator, the carrier, in the hope of reducing the number of those carriers, particularly those who diminishes the number of [illegible] from which the [illegible] spread and it should be noted that these cases are just those [illegible] the most prevalent [illegible] of people. But this [illegible] only help to diminish the [illegible] and [illegible] in the established [illegible] some diseases, and [illegible] have [illegible] smaller than their [illegible] a generation ago. Though it seems that [illegible] against the carrier may have [illegible] yet there is little evidence that it has [illegible] the carrier [illegible] this may well be done in the identity of controlling [illegible] carriers of infectious diseases among a population when the amount and extent of immigration are yearly increasing. The additional movement of infectious [illegible] than out [illegible] the [illegible] in their number caused by improved sanitary measures.

The second factor—the degree of susceptibility of the population—must now be discussed. We all know how the susceptibility of the population as a whole varies. An epidemic occurs in a country free of many susceptibles, and the population as a whole remains free for a generation

from [illegible] required to bring [illegible] fully full specific resistance [illegible] [illegible] ing in with [illegible] that [illegible] what I call non specific resistance which is very important but on the whole seems to me [illegible] much in preventing bacterial invasion as by combating invasion when [illegible] it has occurred. The fact is in non specific resistance as in those of personal hygiene. In the [illegible] school medical officer and dentist [illegible] most to prevent the [illegible] of disease than all the swabbing [illegible] [illegible] [illegible] months or respiratory passages. Other things [illegible] with adequate vitamin content [illegible] and [illegible] and fresh air. These things are well recognized and public health workers are doing their best to improve them. To a certain extent the increasing of non specific resistance is a part of the war against the microbe and may actually diminish the specific bacterial resistance in a population. This latter is due to previous infection not always accompanied by symptoms that is a lot of it must be due to previous carrier infection as well as to infection with pathogenic organisms of low virulence perhaps even to infection with organisms we should definitely class as non pathogenic though similar possibly even to infection with non-pathogenic dissimilar organisms. It is true that specific immunity substances for pathogens cannot be demonstrated in the blood of those carrying their harmless imitators, but our methods are not ever sensitive and we have much to learn yet in technical immunology. Glenny and Sudmuersen's [18] work shows that a stimulus from a toxin (e.g., diphtheria) may be insufficient to produce a recognizable antibody but a second no greater stimulus following this primary one may produce antitoxin in great quantity. This work may well be a hint as to how immunity relative or complete becomes established in a population even though specific immunity substances cannot be demonstrated. Take my experience in H.M. Hospital Ship *Agadir* which for over six months in 1918 and 1919 was full of acute influenza cases, many with the worst type of inflamed lungs. A medical man in daily may hourly close contact with these cases preserved his lungs intact, when a much fitter specimen of a man succumbed within forty eight hours of his first exposure to haemorrhagic pneumonia. Why was this? Was it because the former always possessed a mild form of pneumococcus in his nose which the latter did not? In the *Agadir*, too the ship's company had a no greater case incidence than other ships. Was it because they had received a primary stimulus from the milder groups of organisms causing the spring epidemic, and hence responded at once to the secondary stimulus of the more severe bacterial complexes of the winter epidemic wave? I do not know. I merely ask the question.

Such observations however do make one think that a body used to dealing with one bacterium will deal better with another, even if dissimilar than a body with no previous bacterial experience. For this reason perchance, it may be dangerous to render a population altogether free from bacterial infection.

[illegible] What will happen to this people when [illegible] virulent [illegible] nation escapes the vigilance of the sanitarians [illegible] work lurked in this virgin soil. There would [illegible] an explosive epidemic of great magnitude. [illegible] virulent organisms would [illegible] in the [illegible] giving us from [illegible] In the [illegible] the [illegible] encouraged the mobilization of the disease—[illegible] the resistance of the population against [illegible]

Therefore I think the easiest and surest line for preventive medicine is the concentration on raising the tolerance of the people to bacterial [illegible] by the use of antigens. Typhoid fever can be controlled in this way, probably so could diphtheria. Prophylactic vaccines are still mainly used as regards respiratory diseases but I think published figures show that though admitted the evidence is slight as regards their effect on the incidence of the disease it is definite as regards the effect on case mortality. This [illegible] is rather what one would expect if Glenny and Sudmersen's primary and secondary stimulus theory should prove of general application. Therefore I think that in such a disease as epidemic influenza, so pleomorphic in character, with so short an incubation period, associated with numerous organisms forming puzzling bacterial complexes and transmitted by hosts of carriers of similar organisms, an efficient antigen is our only hope of control. The ideal vaccine or antigen would raise the resistance against all bacteria and would preferably be administered by the mouth. Some day in the future the human species may be immunized against harmful bacterial invasion by means of swallowing a pill every month or so. This conception of an ideal antigen is not so far fetched as perhaps it may seem. Let me mention three pieces of recent work on immunology that may be the first step towards this goal. First Warden [19] in a series of very careful researches seems to have demonstrated that antigens are probably mixtures of fatty acids dispersed in colloidal solution and if the right proportion of fatty acids is ascertained and correct colloidal phase reproduced artificial antigens can be made as effective in producing immunity as the natural organisms, and nucleoprotein, still specific protein is not a necessity for antibody production. One at present must reserve judgment, but should others be able to repeat his experiments with constant results, this work should prove one of the greatest recent advances in immunology. Secondly there is the Twort [20] or d'Herelle [21] phenomenon, which the latter explains as a finite superparasitism—that is to say in bacterial infections—for example Shiga's dysentery—a filter passer may be obtained having the power of killing and dissolving cultures of Shiga's bacillus. This property can be propagated from culture to culture, and d'Herelle considers the power of

by [illegible] a virus that preys on bacteria and which he [illegible] Through d'Herelle's facts have been abundantly confirmed by others, I think most authorities prefer to consider the explanation in terms of bacterial variation rather than that this bacteriophage is an actual parasite of a bacterium. However, should further research show us the way of producing this deleterious lysis of bacteria at will practical immunology will have gained another powerful weapon because this lytic effect, whatever the explanation is undoubtedly one of the methods by which animals recover from disease. (Note however that it has nothing to do with the well known lysis occurring in bacterial complement fixation.) Thirdly, Besredka's [22] work on immunization with bile and typhoid suspensions via the alimentary canal shows the possibility of using this route instead of the subcutaneous—a more important point than may at first appear—because the normal human animal will always instinctively resent the trauma of the needle, whereas most people are instinctively pleased to swallow anything which they believe will do good and mass immunization by the mouth in a free people becomes a more feasible proposition than at present. Therefore the ideal universal elixir for preventing all ills is not the fantastic idea it would have been ten years ago.

Meanwhile much spade work requires to be done in testing vaccines under conditions approved of by expert statisticians. More work of a tedious nature is also required on the complete bacterial flora of the nose and mouth of sample populations during epidemic and inter-epidemic periods before we can hope to get on the real relations between mutualism, saprophytism, the carrier state and harmful parasitism. In this important class of work, ultimately the most important as judged by the saving of life and increase of health to the species, man the Army is to be congratulated on leading the way. It has proved to the complete satisfaction of those competent to express an opinion that enteric disease can be controlled by an efficient antigen.

Again, though on a smaller scale, the same thing has been done before, it was the mass swabbing in the Services during the cerebro-spinal fever outbreaks that made everyone realize the complexity of the bacterial flora in the upper air passages of apparently healthy people and produced Glover's [23] almost classical demonstration of the effect of overcrowding in the spread of bacterial infections of this type.

The classification of the bacterial complexes present in health and illness, the testing of prophylactic antigens under controlled conditions, is essentially the work for the Services with their facilities for disciplinary control and power of keeping in touch with the subjects of investigation. Here indeed is the chance for any philanthropist who wishes to endow a research that would be bound to yield a return for his money.

Professor Cummins at our last meeting pointed out the same thing with regard to tuberculosis, and I would like to extend his remarks to all

respiratory [illegible] Some may perhaps think I have exaggerated the importance of carrier infection It is only after all, a special example of case to case [illegible] In some diseases the latter is usual as for example smallpox In others as for example cerebro spinal fever the carrier infection is the [illegible] method of spread The respiratory carrier is of such importance [illegible] of the difficulties of finding and dealing with him He makes all sanitation and quarantine regulations imperfect as regards prevention It is now admitted that man is by far the most important reservoir of his own infections and the carrier accounts for the vast majority of those cases of infectious disease previously attributed to bad sanitation infected houses or climatic conditions

I [illegible] conclude with a view of the future Man as a species has at last achieved scientific government and gained control of the floods of energy that flow from the sun to waste in light tides or elemental decay Effort [illegible] ally applied and every one has plenty of leisure and facilities [illegible] The movement of the species will become so extensive that [illegible] in New York from London will be an ordinary procedure public health work will have eliminated bacteria to such an extent that [illegible] of the species as a whole to bacterial invasion will be lower [illegible] ever been Then owing to some hygienic breakdown, a [illegible] organism gets loose In this environment before one will have [illegible] what has happened the world may well suffer a pandemic of [illegible] magnitude beyond imagination Possibly human civilization if not the whole species man, may be destroyed This may not be as wild a speculation as the unimaginative may think Two thousand years ago the malarial parasite destroyed Greek civilization and in the late war in the same locality the same parasite might have finished the British Empire but for the work of Manson and his colleagues Dominant species too have disappeared for no apparent reason Millions of years ago Saurian reptiles were the dominant species Why they did not remain so we can only conjecture Was it perchance due to a failure in mutual adaptation between them and their parasites? To man the disappearance of his own species seems a terrible affair but why should man consider he is the last word in evolution? If he fails to adapt himself to his parasitic environment he will disappear like any other species, and the prevention of this biological tragedy may perchance be bound up in the solution of the carrier problem

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[illegible]

## CASE THE TRAVELLING ASSISTANT TO THE ROYAL NAVY ESTABLISHED BY THE ROYAL ACADEMY OF THE MEDICAL DEPARTMENT OF THE ROYAL NAVY

[illegible]

My own [illegible] and I trust [illegible] with me [illegible] mildly [illegible] lessened.

It would [illegible] living as I [illegible] citizen [illegible] himself and [illegible]

My intent [illegible] after results [illegible]

**Notes on Military [illegible]**

During the [illegible] and later will [illegible] putting his [illegible] in such a position [illegible] ligament [illegible] plaster of [illegible] movement of the [illegible] torn fibres [illegible]

Various [illegible] such a case [illegible]

[illegible] infinitely superior to those previously obtained by [illegible] wet bandages or the application of some [illegible]

[illegible] for the last eighteen months to serve on [illegible] Naval Hospital Chatham and there I have had [illegible] of attempting to save—with varying success—some of the orthopaedic cases which would have been invalided out of the Service under ordinary conditions There is nothing strikingly novel in the following briefly recorded cases in which I have tried to apply the operative and manipulative methods of Sir Robert Jones —

(1) ANKYLOSIS RIGHT ELBOW —E A T aged 17 Boy telegraphist Admitted to the Medical Section, Royal Naval Hospital Chatham on October 21, 1921 He complained of pain in the right elbow No history of trauma or gonorrhoea The joint was swollen and very tender The temperature varied between 101° and 103° F Nine days later the left shoulder and left ankle became affected The two latter joints were practically normal again in about a fortnight but the condition of the elbow persisted

He was transferred to the Surgical Section on January 16 1922 with the right elbow firmly ankylosed in extreme supination and extension X rays showed rarefaction of the lower end of the humerus with tendency to blurring of the bone outline The ulna in the region of the sigmoid cavity gave the impression of bony sequestration taking place

He was given three diagnostic tuberculin injections, all of which were negative

Operation January 25, 1922 The bones entering into the formation of the joint were exposed by Kocher's incision which in the upper part passes between the supinator longus and extensor carpi radialis longior in front, and the triceps behind below, the incision is between the anconeus and the extensor carpi ulnaris Thus the extensor apparatus of the elbow—the triceps triceps expansion and the anconeus, upon which the future utility of the joint so much depends is practically uninjured by the incision

The bone ends were cleared by means of a periosteal elevator and it was found that the cartilages covering the greater sigmoid notch of the ulna and the trochlear surface of the humerus were completely eroded The cartilage over the capitellum and head of the radius although pitted and worm eaten was not completely destroyed The humerus was sawn through at the upper level of the olecranon fossa and the ulna and radius at the base of the coronoid process and the divided portions removed A piece of fat was then introduced between the bone ends and was fixed in situ by catgut sutures the whole cavity having been previously thoroughly irrigated The displaced muscles were drawn into position and fixed by interrupted catgut sutures The skin wound was closed by interrupted silkworm gut sutures It was dressed with white sterile gauze and several layers of wool The limb was then put up in the position of extreme flexion

For several days after the operation he had loss of sensation in the hand apparently due to bruising of the median and ulnar nerves, as this completely returned on the fifth day

The sutures were removed on the eleventh day

From the fourteenth day onwards the limb was kept flexed during the day and extended during the night

Combined with this procedure were massage relaxed movements very gentle faradic contractions and combined galvanism and faradism to the extensors

The joint functions slowly and steadily returned

He was discharged on June 9. He [illegible] the right ankle in a position of dorsal flexion extension and supination [illegible] for all the right ankle joints [illegible] normal.

There was never any suspicion of some hitherto unknown injury of the joint. I have heard [illegible] from the medical officer of his [illegible] he has been performing his duties [illegible] vigorously and [illegible] boat pulling and physical drill [illegible].

My surprise and consequently was great when I learnt a few days ago that his injured knee had decided [illegible] that he was unable to pass his examination [illegible] because of his slovenly walking down messages.

Nevertheless as a result of operative treatment massage &c., he now possesses a very useful upper extremity instead of an entirely worthless appendage, with elbow joint immobilized in position of full extension and one quite incapable of performing any such action as [illegible] food to his mouth adjusting his clothing or any other necessary or ordinary [illegible].

(2) Rupture of Ligaments of the Knee.—L. J. A., aged 33. Quartermaster Sergeant, Royal Engineers. This non-commissioned officer received a severe injury to his left knee while [illegible] recruits Rugby football during which he was tackled heavily by one [illegible] another fell across his left knee. He was admitted to the Royal Naval Hospital Chatham immediately after the accident on October 4, 1922. On admission he complained of severe pain in his left knee which was found to be much swollen and very tender, especially on the outer side. Radiographs revealed no bony abnormality. On the knee being examined under a general anæsthetic it was found that the tibia could be displaced easily to an unbelievable extent forwards, backwards and laterally on the femur.

This was evident that a very severe lesion of the joint had occurred and one which tallied with the description of the rupture of the cruciate ligament as described in surgical textbooks.

*Treatment.*—The leg was put up in a back and two side splints in the fully extended position. The knee was kept rigid in this position until October 21 when general massage treatment was commenced. The swelling and tenderness of the knee had then quite disappeared and it improved steadily as regards stability. A month later (November 29, 1922) a Howard Marsh's knee cap with lateral knee supports, was applied and the patient was allowed up on crutches. He was able very soon to discard the crutches and was discharged to duty on December 15, 1922. Although still wearing the Howard Marsh's knee cap he is carrying on efficiently with his duties as quartermaster sergeant, but, to use his own words, he isn't giving Rugby football a thought.

(3) Ankylosis of Both Ankles, Left Knee and Several Inter-phalangeal Joints, and Commencing Ankylosis of Left Hip.—P. W. H. J., aged 16. Boy. This boy was admitted to the Royal Naval Hospital Chatham on April 28, 1923 from Shotley Training Establishment suffering from the above disabilities. There were the after results of chronic medical followed by pyæmia, followed by suppurative arthritis.

At first it seemed absolutely certain that nothing could be done as he was in such an unsatisfactory general condition.

The numerous joint lesions made one think that he was doomed to the sad fate of being a bed ridden cripple for the remainder of his days and especially as the x rays showed extensive osseous changes in all the above mentioned joints.

*Treatment.*—The patient was kept in bed on dietetic and tonic treatment to improve his general condition and given a series of tuberculin diagnostic injections. The whole series were negative. On May 14, 1923 massage treatment was commenced and thirteen days later sunbathing baths &c. were added. He improved slowly and steadily, flexion and extension returned to his left ankle and left knee, whilst the left hip became practically normal in function. He was

[illegible]

[illegible]

[illegible]

[illegible] on their leaving hospital the necessity of [illegible] correct footwear if they would avoid recurrence [illegible]. The foot wear should be [illegible] straight on the inner [illegible] perpendicularly from the sole, &c.

[illegible] degrees of this crippling [illegible]. Nevertheless it is unlikely [illegible] which have progressed [illegible] the third, fourth and fifth [illegible] would certainly be impaired [illegible] the disease is very slowly [illegible].

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

other have had this I find as an entering the Service and if so it proves slackness on the part of the examining medical officer it is not unfair to question to make on the applicant they must have a point it after war. It may have been in a minority of cases *e.g.* under a liability of with trauma diseases such as general influenza—in short any affection which causes stretching of the inferior calcaneo scaphoid ligament followed by a strain on that ligament before it has had time to return to its normal after it has been softened by the toxins and toxin. It is that of gonorrhœa or by inflammatory reaction caused by the in organism of rheumatism or influenza or even trauma, e.g. overtightened by a blow *e.g.* as in one of my cases by a shell falling on the dorsum.

Whichever of these has been the causative factor in the case I would say to other medical officers to keep a very careful look-out for the insidious onset of deformity. These are pain across the dorsum of the foot in tenderness on pressure over the site of the inferior calcaneo scaphoid ligament i.e. just below the tubercle of the scaphoid.

How often is this condition seen among rapidly growing boy patients suffering from gonorrhœal infection and those recovering from acute infective diseases *e.g.* rheumatic fever, typhoid and influenza. Early in the appearance of such conditions active treatment is of immense value. The patient should be put to bed with the foot at right angles to the leg in a rectangular splint and two side pieces with pads so arranged that the foot is adducted at the mid-tarsal joint and inverted. This treatment should be maintained for two or three weeks until the pain and tenderness have *entirely* disappeared. Then the patient is allowed up in suitable boots with the heel one third of an inch higher on the inner side and tapering gradually to its outer side. In addition the length of the heel should be extended forward by three quarters of an inch on the inner side and the side should be raised one third of an inch by a patch just below the head of the first metatarsal. Strict injunctions must be given the patient that he is *not* to put his foot to the ground without the artificial aid for at least six weeks otherwise he will unwittingly allow the arch to descend and so inflict a fresh strain on the affected ligament.

The necessity of corrective boots I have frequently had made on board ship. Whilst the patient is wearing a boot of this description massage, gentle exercises, contrast bathing &c. should be employed to obtain good muscular and ligamentous tone. I feel sure that if medical officers took up these lines of treatment (which are so very easily carried out) the necessity for invaliding men—in many cases highly trained technical ratings—for pes planus would become a thing of the past.

In conclusion I should like to express my thanks to our Chief of the Surgical Section in the Royal Naval Hospital Chatham—Surgeon Captain A. Gordon C.B., O.B.E.—for his support and friendly criticism on the

[illegible] the above cases To my colleagues Surgeon [illegible] Smith and Surgeon Lieutenant-Commander [illegible]

I [illegible] for the able manner in which he has admin[illegible] [illegible] out, anæsthetics and also for directing the [illegible] treatment Since massage and exercises in [illegible] [illegible] and leads up to the ideal of fitness—but [illegible] serve the State in an economic sense [illegible] return to the regiment and fight once more in the [illegible] Sir Robert Jones) to my fellow colleagues for ably [illegible] operations Lastly but by no means least I wish to [illegible] of gratitude I owe the Sisters and Sick Berth Staff [illegible] enthusiastic interest which they displayed in making the [illegible] these orthopædic cases good ones

# Naval Medical History of the War

## SURGICAL SECTION (*continued*)

[illegible] Surgeon-Captain WILLIAM [illegible]

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## CHAPTER III.—REGIONAL SURGERY (*continued*)

### WAR BURNS AND THEIR TREATMENT

[illegible] JOSEPH CHAMBERS, C.M.G., M.D., F.R.C.S.

[illegible] very large number of burns was dealt with [illegible] boilers and on board ship.

[illegible] were what may be called [illegible] explosion of high explosive shells and [illegible] were [illegible] radiate burning transfer from [illegible] gun [illegible] by bursting their fuze.

[illegible] was a number of burning [illegible] principal. The [illegible] of [illegible] burns fall by contact [illegible] burning the path of least resistance with [illegible] required [illegible] intense in confined spaces that even [illegible] melted [illegible] under H. L. R. Stephens, O.B.E., [illegible] H.M.S. [illegible] Portland, [illegible] manner [illegible] occurred during the action. The [illegible] quoted [illegible] performed by a heavy shell which burst within [illegible] burning all the material of the [illegible] addition to [illegible] front of [illegible]. Almost [illegible] if not [illegible] burning the flesh from his [illegible] explosion [illegible] the upper [illegible] burns also showed on the trunk which [illegible] right which was [illegible] burning the [illegible] this sheet of [illegible] burning [illegible] put the shell [illegible] burning on to the [illegible] and then [illegible] burning [illegible] the heat [illegible] both glass and [illegible]. All the [illegible] of the passages were [illegible] the [illegible] burning. The [illegible] burning the [illegible] in some [illegible] the hot [illegible] and [illegible] way by [illegible] the [illegible] upper [illegible] was similar to [illegible] testifying to [illegible] At one point where the flame had

[illegible]

[illegible]

[illegible]

[illegible] with shock are here briefly [illegible] led in sequence

[illegible] temperature should be [illegible] a partial one according [illegible] placed in the bath [illegible] their removal [illegible] in the bath for several [illegible]

[illegible] —[illegible] should be given [illegible] *per* [illegible] is [illegible]

[illegible] saline [illegible] —[illegible] only up to [illegible] but

(3) *Pituitary* [illegible] —The intravenous injection of [illegible] is most valuable [illegible] the blood [illegible] increasing the [illegible]

Assuming that the [illegible] the condition of the [illegible] improving, [illegible] applications—[illegible] discussed [illegible] methods of [illegible] blood pressure [illegible] the limbs and [illegible] stimulant [illegible] coffee &c [illegible]

Local [illegible] —[illegible] local applications [illegible] then [illegible] treatment for [illegible] evolved

A list [illegible] given —

Picric acid Carbolic [illegible] paraffin treatment (Ambrine) [illegible] dressings [illegible] the open method—the raw surface [illegible] dusted [illegible] powder and exposed to the air [illegible] tincture [illegible] aluminium acetate potassium permanganate [illegible] and &c) the Cargile treatment (using as a dressing [illegible] of [illegible] olive oil), ilvine, nikalgin &c

In this long list of remedies (to which [illegible] is added) it is obvious that many of them [illegible] and that in the course of the treatment [illegible] another according to the progress of the case always bearing in mind that the main object of treatment is to (1) prevent sepsis (2) avoid giving pain (3) minimize scarring and (4) minimize as far as possible subsequent contractions and deformity

Concerning some of these remedies a few remarks are worthwhile

[illegible] remedy [illegible] permit the [illegible] seem to [illegible] and [illegible]

[illegible]

[illegible] freedom from pain at the [illegible] treatment. The writer [illegible] preparation

[illegible]

[illegible]

[illegible]

In conclusion the writer [illegible] his indebtedness to [illegible] his naval medical colleagues in [illegible] articles and especially in the subject of Tropics and their influence he has extracted much information. More especially does he owe a debt of gratitude to Surgeon Rear-Admiral V. G. Heath, C.B.; Surgeon Rear-Admiral W. Axford, C.B.; Surgeon Captain M. L. I. Redd, O.B.E.; Surgeon Commander W. L. Martin, O.B.E.; Surgeon Commander Horace E. R. Stephens, O.B.E.; and Surgeon Commander R. J. Willis, M.V.O., O.B.E., V.D., R.N.V.R.

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## SECTION OF TROPICAL AND SUB-TROPICAL MEDICINE

ARRANGED BY SURGEON REAR-ADMIRAL SIR PERCY BASSETT SMITH, K.C.B., C.M.G., F.R.C.P., F.R.C.S., D.T.M. AND H., R.N. (Ret.).

*Introductory.*—For administrative and tactical reasons the naval forces in 1914 were divided up into a number of stations and fleets. These were: Home Fleet, Mediterranean, East Indies, China, Australia, Cape of Good Hope, North America and West Indies, and Irregular Force.

There was always a considerable amount of movement of ships from station to station, men from ship to ship, and men from ships to hospitals, so that undoubtedly one case might be entered several times during the course of a prolonged illness. Every endeavour has been taken to eliminate the errors thus likely to arise, but probably some remain. The stations most affected by the war were the Mediterranean, East Indies, the Cape, and also the ships of the Irregular list which were in communication with the West Coast of Africa.

The diseases which are here detailed are:—

(1) Malaria and Blackwater Fever.
(2) Trypanosomiasis and Kala Azar.
(3) Dysentery, Sprue and Liver Abscess.
(4) Mediterranean or Undulant Fever.
(5) Dengue and Phlebotomus Fever.
(6) Beri-beri and Scurvy.
(7) Schistosomiasis.

### PART I.—(1) MALARIA AND BLACKWATER FEVER

BY SURGEON REAR-ADMIRAL SIR PERCY BASSETT SMITH, K.C.B., C.M.G., F.R.C.P., F.R.C.S., D.T.M. AND H., R.N. (Ret.).

From an historical point of view malaria has almost always had a definite effect upon the course of great campaigns.

It was a source of weakness in the army of the early Greeks; in the Napoleonic wars it caused a terrific wastage of the forces; in the Boer War malaria was only second to typhoid in its malign effects, and throughout

Plague and cholera, though threatened, never gave rise to any epidemics in the naval forces.

the past Great War our armies and those of our allies [illegible] enormously in different parts of the world

With the Navy the disease has also been very prevalent [illegible] tropical diseases it has given the greatest number [illegible] being even greater than that of dysentery, though the [illegible] in the latter The widespread distribution of the [illegible] employed wholly or largely on shore brought about the high incidence cases, as was found in the Army forces engaged in the same areas, but there are some peculiarities which will be noted later

A good knowledge of both normal blood and the appearance of the parasites is very essential for every naval medical officer, which of necessitates the presence of an efficient microscope in every ship going to a malarial area Personally, I think that every medical officer should have his own and keep it with him at any rate it is an administrative error to send any ship to a tropical or unhealthy climate unprovided

Roughly speaking no marked increase in knowledge with regard to the clinical characters of malaria was gathered the greatest interest lay in methods of prophylaxis and treatment of cases The most interesting returns of cases were obtained from the Cape, Malta and the home hospitals owing to the constantly repeated relapses of the disease and the intense cachexia often predisposed many men were repeatedly treated in different hospitals

TOTAL CASES (TOTAL FORCES 1914 108 800 MEN)

| | 1914 | 1915 | 1916 | 1917 | 1918 |
|---|---|---|---|---|---|
| Total cases | 1,265 | 1,599 | 2 696 | 3 936 | — |
| Admitted to hospital | — | 268 | 675 | 1 341 | 995 |
| Deaths | 7 | 2 | 21 | 11 | 6 |

In 1914 there were 291 cases which were contracted at Tampico in Mexico previous to the great war During the subsequent four years 738 cases were treated in the Royal Naval Hospital at Simonstown these were contracted in the West African Expeditionary Force in the Cameroons South West African and East African Expeditionary Forces, the last including those from the Tanganyika and Zanzibar Most of the men from the naval station on the lake developed the fever after leaving whilst travelling under conditions of great hardship From equatorial West Africa every case was infected with the subtertian parasite with or without a combined quartan infection Those from South West Africa were infected about equally with the tertian or subtertian, and in those from East Africa the tertian predominated

CASES TREATED IN DIFFERENT FOREIGN HOSPITALS AND HOSPITAL SHIPS

| | 1915 | 1916 | 1917 | 1918 |
|---|---|---|---|---|
| Cape | 16 | 108 | 291 | 74 |
| Malta | 21 | 214 | 176 | 33 |
| Gibraltar | 98 | 30 | 31 | 26 |
| Madras | | 186 | 231 | 24 |
| H M H S *Europa* | | | 149 | |
| H M H S *St Margaret* | — | | 347 | |

Many cases were from the Bulgarian coast, those from Tientsin were very severe with very short incubative period two days residence was said to be long enough More cases were reported this year from Hong Kong

At the Dreadnought Hospital in the Naval wards 117 cases were treated The subtertian parasite was found in thirty one the tertian in fifty three and in thirty three cases no record of parasites being found was obtainable From these a small idea of the geographical distribution of the parasites usually causing the fever could be gathered From the British Expeditionary Force in the Cameroons most cases were infected with *P falciparum* often together with *P malariæ* At Cape St Mary (Bathurst) and Sierra Leone *P falciparum* was almost constant From South West and South East Africa *P falciparum* and *P vivax* were both present the latter being the most common except from Zanzibar where the malignant type was most in evidence From the Persian Gulf the *P falciparum* again predominated though many relapsing cases treated in England were due to *P vivax* From the Mediterranean all three forms of parasites were found depending upon the season of the year and the exact locality in some limited areas *P malariæ* were generally to be found The tertian seemed to be the most frequent cause of relapses at home From the forces employed in Northern Russia and in the Danube Flotilla subsequent to the armistice practically all cases were due to *P vivax*

During the war Castellani in particular drew attention to the irregularity of the symptoms of malaria especially in the Balkans and the Middle East how almost every other acute disease from cholera to sunstroke had its counterpart in malaria Extreme cases showed a pale unconscious patient with small pulse and subnormal temperature or one in acute delirium with flushed face and dilated pupils and hyperpyrexial temperature—yet in the peripheral blood both might be shown a very heavy infection of malignant malarial rings In a malarial area a diagnosis of malaria must never be ruled out unless a careful examination of the blood has been made no matter how strange the symptoms may be In the chronic cases seen in the later stages in England the condition varied little cachexia wasting headache and general lassitude with rarely a palpable spleen The systolic blood pressure was low, and the pulse tracing deficient in tone The blood would show a diminished red count with a relatively low polymorphonuclear and a high lymphocytic and mononuclear count It was exceptional to find malarial parasites (except crescents) in the peripheral blood unless there was a febrile relapse for most had received much quinine treatment The temperature curves, carefully recorded frequently gave definite evidence of malaria when no parasites were to be found—a periodic raised subnormal temperature being not at all uncommon

Three anomalous conditions were found (1) pyrexia undoubtedly due to malaria in which the most careful search showed no parasites in the

peripheral blood, (2) parasites present with no clinical evidence of pyrexia (3) an outbreak of fever with presence of parasites while under full quinine or arsenic treatment This I first noticed from Salonika cases in 1904 at Ilusiar The loss of service due to the frequent relapsing cases was very large and the invaliding was considerable Unfortunately there was in the Navy no general hospital centre where the men could be systematically treated and proper records kept (as was recommended by me in the early part of the war) nor was there a malarial record sheet so important for information and late treatment of the cases At each hospital the treatment and routine varied At the Cape it was reported that subcutaneous injections of quinine were invariably followed by abscess formation and this method was soon given up Intramuscular injections were then generally used and gave good results

At Malta the usual routine during the war was an intramuscular course of ten to twelve injections of the bihydrochloride a total of 150 to 180 gr followed by the oral administration of 15 gr of the hydrochloride for twenty one days This plan seems to have given the most satisfactory results especially when the infection was recent and was invariably followed by marked improvement At Mudros, Surgeon Commander Myles C B E reports that most cases were of the subtertian type and contracted at Thasos which in spite of many efforts made for prevention remained the most unhealthy spot in the Ægean The ordinary routine treatment with quinine was vigorously carried out, the drug was given in the fluid form by the mouth and in obstinate cases it was given intramuscularly He was of the opinion that all malignant cases and chronic forms should be treated with galyl Two doses of 0 3 gm with a two day interval This gave most satisfactory results the patients losing their anæmia and depression, with a marked increase in their appetite and general feeling of well being

In England all forms of treatment were used I prefer, in chronic cachectic convalescents with frequent relapses, to administer the quinine intermittently, 30 gr on Wednesdays and Sundays, and to give regularly an iron and arsenic mixture to feed the man up allow them out with plenty of fresh air, to shun enemas shows and to avoid as far as possible hospitalizing the cases The quinine is taken for three months after the last relapse

During the last two years of the war, owing to the transport difficulties from the intensity of the submarine warfare, there was a continuous rise and overcrowding of the harbours at Sierra Leone and Dakar with ships that were awaiting convoy home In pre-war days it was exceptional for more than two or three ships to be in the harbour of Sierra Leone at one time whereas in 1918 as many as forty or fifty might be counted there

The shore population was heavily infected with severe malaria and this spread to the ships to such an extent that often they were rendered unable to be handled by their crews Many of the ships also had to call

in at D[illegible]h was a hot bed of infection The type of fever on board was often [illegible] very severe character and was by some mistaken for relapsing fever great difficulty being found in obtaining an accurate microscopic diagnosis From these ships large numbers of malarial cases were landed at various English ports and sent to hospitals—this was the cause of the question being brought forward as one of urgency, and in January 1918 an Inter-Departmental Committee was called to consider the question of malaria in ships calling at Sierra Leone and Dakar and the tropical ports of West Africa and to advise in connection with the sanitation

During the last five months of 1917 virulent malaria was reported in August a suspicious illness was present among Australian munition workers in a ship that had called at Sierra Leone some of these were treated at St George's and St Mary's Hospitals, London the cases were at first diagnosed as influenza or enteric, and there were three deaths before the true cause was discovered

Dr Willoughby, M O H , reported epidemics of malignant malaria in ships from the West Coast arriving in the Port of London and Dr Hope Liverpool reported that almost all vessels from the coast arriving there had their crews crippled with malaria

In November, 1917 twenty four cases were admitted to Plymouth Hospital contracted at Dakar and fifty-two were admitted to Pembroke Dock also contracted from the West Coast ports A circular with regard to prophylaxis was sent out by the Admiralty Local Government Board and War Office and no landing was allowed Dakar appeared to be the most highly infected port and many deaths occurred out of one group of fourteen cases four deaths took place In 1917 there were 528 cases of malaria reported in H.M ships from the West Coast of which fifty nine cases were contracted in one ship at Sierra Leone In March 1918 Surgeon Commander E J Steegmann R N V R , was sent out to investigate and report At Sierra Leone many of the ships undoubtedly became infected from the shore, the positions of the ships and the over crowding favouring this, and it was evident that very radical anti mosquito measures were required on shore with more efficient drainage of Freetown and the closing of old wells , £20,000 was set aside for this and £8,000 for 1918 There was, however, very considerable local opposition to many of the methods being carried out which were recommended An additional medical officer was required to be sent out and Major R Farrar was therefore appointed he arrived in September 1918 as acting medical officer and he was most energetic with the local officer in this mosquito campaign For oiling it was necessary to provide a mixture which would be efficient, economical and would not tempt to theft This was two parts of kerosene and one part of Sanitas fluid 180 breeding places for anophelines were located in the town and these were all oiled House-to-house inspection was regularly carried out which was chiefly important in destroying

stegomyia mosquitoes. During Dr Furrare's term of office 350 wells were closed, it was found that in the rainy season 22 per cent acted as breeding places and in the dry season about 13 per cent. It was estimated that at least ten years would be required to efficiently drain the whole municipal area of Freetown therefore it did not come into the practical politics of the war

Dr Steegmann on his visit to Dakar—a French colony—landed on March 21 1918 The British permanent station consisted of a rear-admiral in charge five staff officers and seven or eight ratings accommodation was very bad and facilities for work and improvement were much hampered possibly through local jealousy There were two hospitals and a Government bacteriological laboratory which was then chiefly employed in making antiplague vaccine for St Louis where there was a severe epidemic The result of Dr Steegmann's investigations was to close down the port for our ships and only use Sierra Leone for the assembly of convoys The committee and its work terminated in January 1919 with a letter to the Secretary of State for the Colonies recommending that the work commenced at Sierra Leone should be continued

At Cape St Mary 73 miles from Bathurst on the West African coast, a Naval wireless station was established the medical report by Surgeon Commander C K Bushe, O B E was very full and interesting and is here largely quoted The site chosen was on the side of a low hill well above the low swampy land which separated it from Bathurst It was sheltered from the strong winds The station consisted of a separate residential building and an operative building and power station combined The former was thoroughly screened and fairly airy, but there was no through ventilation and the accommodation was insufficient for the staff The latrine was inside the building The water supply was rain collected in a large concrete tank from the roof and was boiled and filtered before use Earth closets were found to be the most satisfactory

The complement consisted of one medical officer in general charge, wireless officers naval engine-room ratings and natives—the total varying from fourteen to twenty—and, as will be seen practically every man contracted malaria

| Malaria | Cases | Days sickness | Average complement |
|---|---|---|---|
| 1915 | 15 | 57 | 13 |
| 1917 | 15 | — | 22 |
| 1917 | 8 | — | 14 |

In 1920 the same high incidence is still in evidence. In 1915, of the seven Europeans attacked, five had no relapses and the fever was mild (due no doubt to quinine treatment) In 1916 it was noted that the men suffered much more severely than the officers, twelve cases to three At Bathurst it is a rare occurrence to see an anopheline mosquito while stegomyia are common but near the wireless station (7½ miles out)

[illegible] swarmed for at least eight months in the year The [illegible] at the station was unsatisfactory for the following reasons (1) [illegible] of the native villages these were 400 yards on either side. Mosquitoes were abundant 80 to 90 per cent were proved to be anophelines, chiefly *A costalis*, which mostly disappeared between January and the end of May They were a serious danger to the station and it was found to be impossible to exterminate them (2) Swamps and rice fields in the low lands were the chief breeding places—the wet season lasts from June to October The combined source of danger is from the numerous malarial mosquitoes and the unsanitary populous native villages The children in these villages nearly all pass through one or more malarial attacks, some die others after repeated attacks become immune It will be seen that the mosquitoes infected in the village, travel or are carried by winds to the wireless station guided by its brilliant electric light all that could be done except removing the villages (which was recommended by the medical officer but not carried out) was to prevent entrance of the mosquitoes into the living quarters by careful screening of doors and windows and to destroy insects breeding in the vicinity by taking care that no stagnant water was present close to the house and by using mosquito proof coverings for those who went outside the buildings

It was however from the naval air stations that the greatest number of cases of malaria were received The chief of these were Cassandra and Stavros on the mainland near Salonika Thasos, Mitylene and Imbros in the Aegean, and Otranto in Italy Besides the officers in charge of these stations a special malarial officer was appointed Surgeon Commander Morris O B E who had control of all anti malarial measures in the east and who was highly successful At Cassandra in 1918 about forty men were landed practically in a marsh with orders to work day and night to erect an air shed &c This position was known to be very unhealthy, and in the wet season the lower part of the valley was under water The bright electric light attracted the mosquitoes and during the first three months 90 per cent of the ratings were affected, as many as twenty three being sent to hospital on one day in August and on one occasion there were only eight able bodied men to take out the airship fly bar and land her after the patrol The camp was gradually moved away from the shed and placed on the nearest hill drainage works were got well in hand, paraffin was used liberally and finally mosquito proof huts were put up for the men and officers As a result the incidence of fresh cases of malaria was reduced from 90 per cent in 1916 to 7 7 per cent in 1917 and nil in 1918 On the islands of Thasos and Mitylene where no drainage had been attempted the malarial incidence among our men was very high There was a heavily infected civil population and two species of anopheles were present—*A maculipennis* and *A bifurcatus* Besides the actual landed parties for the airship stations we had monitors, trawlers and patrol vessels

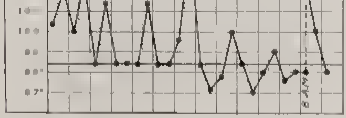
[illegible] unity in touch with the shore and those which were berthed at night close in suffered most At Thasos a monitor anchored half a mile from a particularly bad swamp area had no cases of malaria but it should be noted that in the night wind was invariably a sea breeze A motor lighter tied up to the pier had every man infected Mosquito destruction is undoubtedly the most important means of defence against malaria as is shown in the annexed papers by Surgeon Commander Morris and Surgeon Lieutenant Commander Martin, but there is strong reason to think that the prophylactic value of quinine has rather undeservedly fallen into disrepute. Often exaggerated claims are made and rather too optimistic statements are brought forward so that those with practical experience seeing the frequency of malarial infections in men who are supposed to be protected fly off to the other extreme and state that it is not only no good but may be harmful Many points have to be considered the regular administration the purity of the drug when given the amount of the dose and above all the frequency of reinfections and intensity of the toxin When a man receives an infection of moderate severity there is an incubative period of seven to ten days during which time the number of parasites in his blood gradually increases until there are enough to cause at the subsequent period a definite outbreak of pyrexia If the patient is taking prophylactic quinine he is able to compete with these parasites and the onset of malaria is prevented but if the patient is continually receiving reinfections the inhibitory effect of the quinine is not strong enough and the attack comes on in spite of the prophylactic quinine I few believe that in an endemic area it will absolutely protect the man but that it will generally delay the onset and almost certainly diminish the severity of the disease has been proved except in certain intensely malarial districts where not only the toxicity is remarkable but repeated mosquito infections are constant In naval experience generally the prophylactic use of quinine has been undoubtedly advantageous over and over again in ships crews serving in African rivers who were given the Admiralty routine treatment the men remained free while up the river, but on coming down to the sea where the winds were stronger and chills were more common and often the quinine treatment was stopped then many would go down with mild malaria There had been a period of latency or suppression of the disease indicating the importance of continuing the quinine treatment

*Endemic Malaria in England*—In 1917 all cases of malaria developing among the naval forces in England were recorded and reported, and steps were taken to prevent infection of the healthy The indigenous cases namely those occurring in men who had never been abroad, were chiefly from the air stations in the south east of England

These aerodromes were necessarily placed on flat land near the sea and were surrounded often by marsh land teeming with mosquitoes. A few cases were found at other naval ports and training establishments —

| | 1917 | [illegible] | [illegible] | 1920 |
|---|---|---|---|---|
| Eastchurch, Kent | 6 | [illegible] | 0 | 0 |
| Isle of Grain | 8 | [illegible] | [illegible] | 0 |
| Sheerness | 1 | [illegible] | 3 | 0 |
| Chatham | 0 | 1 | 1 | 0 |
| Portsmouth | 2 | [illegible] | [illegible] | 0 |
| Shotley | 2 | 1 | [illegible] | 0 |
| Total | 19 | [illegible] | [illegible] | 0 |

These cases most commonly devel[illegible] [illegible] August and September All the infections w[illegible] fever was generally mild at first often of [illegible] At East church the marshes came within half [illegible] at 3 in these [illegible] *maculipennis* were common There [illegible] the officers who lived in a mess at the top of [illegible] high In one case there was a definite history of living in [illegible] with men recently returned




from East Africa, and that in the autumn the hut swarmed with mosquitoes At the Isle of Grain the conditions were similar but civil cases were present in an adjacent village At Portsmouth, Chatham and Shotley the infection was traced to recently returned malarial cases It is probable as Colonel James has shown that in the Queenborough area there is a certain amount of endemic malaria in the civil population quite apart from that introduced by the return of infected soldiers and sailors In going over my old diaries I found that almost my first case in the Service in 1883 was one of tertian ague at Sheerness in a man who had never been abroad

The following steps were taken to prevent infection in the area where anopheline mosquitoes were present notification of all cases screening all cases and rapid removal to hospital when infected the cessation of drafting to these stations of all men with recent malarial histories, the destruction of all mosquitoes in the camp and rectifying the surrounding

conditions as far as possible and finally to give quinine for relapse treatment in all old cases of malaria.

The following questionnaire was circulated with a view to obtaining the necessary information with regard to indigenous cases —

SPECIAL INFORMATION REQUIRED CONCERNING INDIGENOUS CASES OF MALARIA

Name Age Rating

(1) Last time abroad if ever
(2) Place of onset of fever
(3) Date of onset of fever
(4) Where employed preceding month
(5) What duty at the time
(6) Presence or absence of mosquitoes
(7) Character of fever
(8) Forms of parasites found
(9) Effects of quinine
(10) Total number of cases of malaria on station up to date
(11) Presence of malaria amongst civil population in near vicinity

*Blackwater Fever* —There were five cases of this disease three of which were in the treatment at the R N Hospital Simonstown Two were from Central East Africa and one from West Africa the other two cases were from H M S *Dwarf* both of which were contracted in West Africa The history of the following case is given as being of interest H A C Bombardier R M A He contracted malaria on the West Coast and there were repeated attacks between 1916 1918 He had constantly taken quinine by the mouth and had received two intramuscular injections In January 1918 at the Cape Hospital an acute attack of blackwater fever came on with rigors jaundice and much dyspnoea the pyrexia was of a continued type the blood when examined gave 2 300 000 red cells and 6,200 white cells per c mm with a colour index of 1 8 No parasites could be demonstrated Quinine with calcium lactate was given and the temperature fell there were two relapses of the hæmoglobinuria —

| | Primary | Secondary | Third attack |
|---|---|---|---|
| Date | January 25, 1918 | February 7 1918 | March 4, 1918 |
| Duration | 4 days | 7 days | 5 days |

The case was invalided to England and there were no further relapses

Special reports are appended on the malaria of the Eastern Mediterranean by Surgeon Commander Morris O B E and Surgeon Lieutenant Commander Martin which deal in detail with the methods of prevention particularly with the air stations in that area

## (c) MALARIA IN THE EASTERN MEDITERRANEAN WITH SPECIAL REFERENCE TO ITS PREVENTION UNDER THE CONDITIONS OF ACTIVE SERVICE

By Surgeon Commander [illegible] Mullins, R.N.

During the war the Navy was called upon to [illegible] ashore in the Ægean Islands and on the Macedonian mainland. The R.N.A.S. formed aerodromes and airship stations at strategic points. Wireless stations and outlook posts had to be occupied at many points. Monitors, trawlers and patrol vessels were in constant touch with the shore activities and, in all, constituted a large force of naval personnel living ashore under novel conditions and in localities where malaria existed.

Malaria is severe and endemic in Macedonia and in certain of the Ægean Islands, and caused considerable sickness amongst the personnel of the R.N.A.S., who were required to live in the proximity of aerodromes placed on the low lying flat expanses which exist between the foot hills and the sea, and which, in many cases, receive and retain the winter flood water from the hills behind.

Malaria in the Ægean Islands exists in localized endemic areas, where drainage has not been attempted notably in the Islands of Thasos and Mitylene. The whole of the coast of Macedonia and Bulgaria, bordering the northern Ægean is particularly infected with a severe form of fever. The seasonal prevalence is from June to October and depends partly on the rainfall, varying in severity from year to year.

Artificial drainage is non existent. The native population is deeply infected, their blood forming reservoirs of infection for the perpetuation of malaria by the numerous mosquitoes of the genus *Anopheles maculipennis* and *A. bifurcatus* which frequent these localities.

Into these areas it became necessary to send bodies of men to establish aerodromes under the conditions of active service. The prevention of malaria was soon discovered to be of the greatest importance, owing to the large numbers of men becoming unfit for service on account of malaria, thereby undermining the use and efficiency of the aerodrome itself.

The prevention of malaria under the varying conditions of active service life resolves itself into the complete destruction of the mosquito in the affected area. Personal precautions are only applicable under certain favourable conditions and are quite unpracticable where night activity is essential, such as in bombing operations and in all the necessities of the various night duties of war. It is therefore, of the first importance to fix upon the most suitable site to place a camp ashore and to understand the various methods of eliminating mosquitoes from the inhabited area chosen.

It is proposed to recount the methods adopted and to state the general principles by which these methods were put into operation.

[illegible]

[illegible] swamps and the possibility of successful drainage [illegible] reasonably short time and without incurring great [illegible]

[illegible] distance of the swamp it is very important to ascertain [illegible] prevailing night wind

[illegible] presence of belts of trees have an important bearing, [illegible] of the country in the immediate vicinity

[illegible] the native villagers gives a valuable clue to the amount [illegible] the existing infection

[illegible] proximity to villages is always undesirable

[illegible] the sub soil water is ascertained as this has an important [illegible] time success of any drainage work

Fig. 1. Old Aqueduct at Thasos

[illegible] of the land and natural drainage facilities are mapped [illegible] the levels marked so as to ascertain the possibility and easiest [illegible] of commencing draining operations

A chart is made marking the various lagoons rivers streams wells and villages, before fixing the best site for a camp which should, if possible, be placed on rising or high ground to windward of the main danger zone and away from trees or thick bushes

The sea beach often ends in being the best locality if the land behind is clear and dry but where possible the high ground is preferable

The local irrigation methods often upset the otherwise healthy locality and take place at the most dangerous time of the season, that is in August

The village gardens, with their numerous wells and stagnant overflow ditches—always supply fruitful breeding places as also do the stone walls and dilapidated buildings supply the resting and hibernation haunts for the mosquitoes.

Olive trees should be particularly avoided when fixing a camp site as these trees when near a swamp, become infested with mosquitoes and

[illegible] pipes can not burn them. The [illegible] attractive to them and they can [illegible] of the olive trees.

The [illegible] the most dangerous zone should [illegible] depends on the direction of the intervening [illegible] the direction of the prevailing night wind.

Mosquitoes [illegible] distances of three eighths of a mile or more [illegible] able, but they [illegible] prefer to remain in the proximity of their chosen breeding places.

By the combination of these conditions, which [illegible] a great deal [illegible] accomplished in preventing malaria at the personnel [illegible] success under war conditions depends entirely on [illegible] mosquito [illegible] eliminating all breeding places of the anopheline mosquito [illegible] render the camp site [illegible] by this means [illegible] have to trust to the less certain methods of personal protection [illegible] which are at all times difficult and often impossible to carry out.

The work [illegible] to suit the existing conditions, and it is intended to [illegible] the main important and recognized methods to be adopted. In the first place an estimate should be stated of the intended work, which should be commenced as soon as the required native working party has been [illegible] from the villages and terms of work and wages fixed.

A party of about [illegible] should be commanded, number [illegible] handle and supervise. Two [illegible] the whole party working under the supervision of [illegible] especially trained in all branches of the work.

The most satisfactory time to commence work is in March when the winter rains are over.

The implements required are spades, axes, [illegible] (a most useful kind of tool), rakes, reaping hooks, scythes, metal stampers on long handles for clearing weed from lagoons, and large metal spraying syringes.

The first operation is always drainage of surface water, to be followed by the most important of all anti-malaria work, namely sub-soil drainage.

Usually an outlet to the sea has to be made and kept permanently open by building a sluice gate in order to prevent flooding from the sea when the wind causes a rise of the sea level near the drain exit.

The main drainage system having removed the surface water, acts in future as a subsoil drain if the level of the subsoil water is high, and will effectually reclaim large areas of hitherto swampy land.

The selective breeding place of the anopheline mosquito is in permanent clear pools caused by the high level subsoil water, and hence the marked success which always follows successful subsoil drainage.

The drains once made must be kept free from weed and overhanging vegetation also protected by barbed wire from damage by cattle Constant routine inspections are necessary to maintain the efficiency, especially in the spring when there is active growth of rushes and weed

Drip cans may be required if the rate of flow is sluggish These are best made from small oil drums fitted with a tap to drip twenty times a minute and firmly fixed to a wooden beam to prevent theft A few drip cans situated at the drain heads are usually all that are required

During the process of drainage, it is necessary to clear large tracts of land from bushes rushes and reeds In the early months this has to be done by implements but a little later it is possible to employ fires on an extensive scale to clear the country of mosquito cover, and to permit the wind to blow freely over the drainage area, thus increasing evaporation and allowing the sun to assist in the drying of the shallow surface water

FIG [illegible] Drainage

[illegible] is rapidly [illegible] and of fires, choosing a [illegible] wind and working [illegible] line of fire

It is most satisfactory to see the results of an extensive fire, which exposes the surface contours and facilitates rapid drainage

Rushes and reeds are best cleared by cutting as low as possible with a sping hooks This operation has to be repeated each spring and is laborious Where possible it is better to dig out the roots in the drains and so save further trouble

All bushes near the camp are burnt or cut away

Burning has to be stopped in June on account of the danger of the fire extending too rapidly and getting out of control, but by this time the work required has probably been accomplished

Filling in work is valuable as it finally obliterates any particular danger spot, such as an old neglected well or a blind ditch or other hole which might become a breeding place It is rapidly performed and relieves one of any future anxiety Many casual breeding places are thus permanently obliterated

The active larval season commences in May and continues until the

first cold days in October Certain larvæ those of the *A bifurcatus* can hibernate as shown and resist all changes of temperature but the larvæ of *A maculipennis* require warm water and develop actively as the summer advances

Oiling and parafining of pools therefore commences usually in April and depends on the conditions present

In order to prevent undue waste of oil and parafin, it is necessary to study the selective breeding places of anophelines These are usually very distinctive and exist in shaded pools supplied by clean and clear subsoil water well away from habitation usually situated in a neglected marsh or in clear spring water

[illegible] subsoil water

The oil used was [illegible] mixed with [illegible] grade parafin being sprayed on the surface of the pool [illegible] of a large brass garden syringe

This should only be done after the surface of the pool has been cleared of all weed and reeds

The overhanging vegetation around the edges is removed by reaping hooks also a space cleared within three feet of the pool which should be noted and marked on a plan of the locality

The oiling is performed once a week and sufficient sprayed on the surface to create a definite continuous film of oil The amount required is usually half a pint to every 100 square feet of surface but this depends on the amount of wind present and the nature of the water

The oiling party proceed to carry out a routine spraying of all standing water at least once a week, and experience soon teaches the success of the method and the amount to be used

Drip cans are economical in use and can easily be kept in order

Owing to the difficulty in obtaining crude carbolic in war time, it was

[illegible] le larvicide when obtainable Dilutions of 1 in 20 [illegible] sufficient to kill larvæ in two hours One ounce added to 16 cubic [illegible] water [illegible] to protect, and is valuable in anti-larval prophylaxis

As larvæ only use the shallow edges of lagoons, it is sufficient only to spray these shallow expansions and not to waste oil on the deeper water where ripples disturb the film and soon disperse the oil entirely

If drainage is successful then oiling is limited to certain permanent pools and to such localities as garden ditches and old wells that cannot be filled in

After heavy rain it is often necessary to spray recent collections of water that are likely to remain for more than a week

The treatment of pools consists in clearing all side growth, defining the edge and clearing of all weed before oiling once a week

Lagoons with shallow expansions require to be completely cleared around the edges of all bushes, rushes and reeds. The main object is to make a well defined edge and to reclaim all the shallow side pockets Weed is dragged out and the wind permitted to blow across the lagoon to promote ripples

Anophelines only choose the shallow and shaded edges in order to deposit their eggs

If the lagoon is near the beach a cutting through the sand is made and kept open in order to make the lagoon tidal Small fish enter from the sea and once the lagoon is well stocked with small fish there will be no further need for constant supervision Stocking pools, lagoons, and drains with small fish is, perhaps the most efficient and economical method and could be more readily employed if understood by the inhabitants

When once the edge of a lagoon has been cleared it may be necessary to fix some barbed wire so as to limit the access where cattle drink as the numerous hoof marks constitute additional breeding spots, not chosen by anophelines but readily used by culex mosquitoes

Old natural water channels need clearing of weed and subsequently shaming by deepening the centre part of the channel which is usually shallow and ill defined

The canalization of river beds and streams in a malarial locality is of great importance A river bed with a slow moving stream is a source of danger in summer months when stagnant rush-grown expansions form where previously the water had power to flow

The work required is firstly to see that the river has free access to the sea, and secondly to clear a defined channel up the bed of the river, so as to promote a narrow swiftly moving stream in the centre and to reclaim all the shallow expansions

The rushes will have to be cut out as a preliminary to cutting a channel to receive the water

This work is most satisfactory and of great benefit

Streams are likewise dealt with and are easily accounted for Side

[illegible] filled in from the bank and a central swiftly flowing channel created. Overhanging bushes are cut away as the working party proceed and this work is rapidly and easily accomplished.

Deep wells are not very frequently of any danger, especially if in use. Shallow wells in the sandy soil near gardens are freely used by culex but not often by anophelines. The type of well that is a danger is one lying where the subsoil water level is high, and through neglect and disuse becomes partially overgrown and hidden.

A large number of these old wells were discovered and, if too large to fill in, they need to be cleared and regularly oiled.

All wells in use should be covered and frequently inspected.

[illegible] channel through the swampy river bed. Removing rushes, reeds and roots.

Good irrigation storage tanks need to be kept free from weed and completely emptied once a week. If not possible to empty they may be stocked with small fish. Gold fish lose their value as larvicides if kept too long in the tanks.

Swampy patches caused by hidden springs need to be dealt with by first cutting away the reeds and defining the spot where the spring emerges. The spring may then be made the head of a drain, with a drip can suspended over it.

Villages are always sources of danger caused by the crude irrigation methods adopted. The overflow water settles in the surrounding ditches which are densely overgrown with bushes and reeds.

Maize field irrigation [illegible] of the period of malaria. Part of the river stream is [illegible] by lethal [illegible] permitted to flow in roughly prepared channels. This causes large [illegible] of stagnant overflow pools at the most infective time of the year, namely the latter part of August.

FIG. 5.—Sites [illegible] completion of work.

Railway cuttings, tramlines, works and [illegible] need inspection [illegible] to locate any leakage of [illegible] water or accumulation of rain water. Trees in the locality should be kept under observation for likely breeding places and if found can be filled in with sand or burnt out with a petrol flare.

Foot hill swamps caused by springs can be treated by digging concentration ditches where the water may be collected and oiled. Usually the water is not in any great quantity at any one particular place and can be readily dealt with. A long drain may be sufficient to take the water which percolates away before it has travelled for any considerable distance.

Having dealt with the local conditions it is necessary to maintain a strict supervision near the camp in order to prevent any casual collections of water in dug outs, ullage pits, empty petrol tins, drains, &c. A sunken barrel, or other thoughtless action on the part of the personnel, may create a prolific breeding place near the camp itself.

*(To be continued.)*

# Clinical and Practical Notes.

(1) ACUTE NEPHRITIS—UREMIA—RECOVERY—DISCHARGE TO DUTY

(2) TREATMENT OF CATARRHAL JAUNDICE

(3) ONE-DAY TREATMENT FOR SCABIES

By Surgeon Captain T. FALCONER HALL, C.M.G., M.B., I.S.

(1) ACUTE NEPHRITIS—UREMIA—RECOVERY—DISCHARGE TO DUTY.

A. H. L., aged 16, B.R.A. apprentice, was admitted on March 28, 1921. Previous history had measles but no scarlet fever or rheumatism. He had not felt well since Christmas, having colds off and on.

Two days before admission while on Easter leave he complained of headache, marked shortness of breath, cough with slight blood stained sputum and slight swelling of the legs and face. He saw a doctor who advised his immediate removal to hospital.

On admission at 6 p.m. temperature was normal, pulse 50. He complained of frontal headache. Both lower eyelids were swollen, and there was pitting of both shins. Heart not enlarged, all cardiac sounds booming. Lungs clear. He could not pass any urine when examined.

At 11.15 it was noticed that patient was restless and that he would not answer any questions; breathing slightly stertorous, and slight facial twitchings were present; skin dry. He had vomited several times since admission a little fluid with undigested food in it. Pilocarpin nitras gr. $\frac{1}{10}$ given hypodermically, and hot bottles placed round the patient.

At 11.30 he was quite unconscious, and violent uremic convulsions commenced so that it was difficult to keep him in bed.

Pilocarpin nitras gr. $\frac{1}{10}$ was repeated and he was sponged down with hot water and kept between hot blankets with electric radiators replacing hot bottles. He began to perspire slightly. A vein at the left elbow was punctured and 3 oz. of dark blood aspirated and 8 oz. of normal saline injected, owing to the convulsions urine could not be run in.

At midnight he was quite unconscious, and the convulsions were checked by the inhalation of ether, which was commenced when the convulsions became well marked.

His condition remained practically unaltered, though he was sweating profusely, until 1.30 a.m. when acute œdema of the lungs developed, and his mouth, cheeks and throat were filled with œdematous exudate; swabbing was of no use, and it looked as if he would be suffocated. Atropine sulph. gr. $\frac{1}{100}$ was given hypodermically, and immediately the œdematous exudate was dried up and his cyanotic condition improved.

The convulsions ceased, and he passed into a hysterical condition about 2 a.m. and had to be removed to a cabin as he was so noisy that he was disturbing the whole ward.

During the uremic convulsions he passed urine and fæces involuntarily. He was restless until 4 a.m. when he fell asleep and slept for three hours. The first urine that could be obtained was neutral, sp. gr. 1012, albumen was present and, microscopically, casts of all kinds, red and white cells and renal epithelium were present.

During the forenoon he answered questions readily; his tongue was moist but the skin was rather dry, so a hot air bath was ordered, and kept going all day. He was allowed fluids and milk, and his bowels were kept well open with magnes. sulph.

M[illegible] very well [illegible] complains that he is hungry

E[illegible] atrophic inflammatory changes present, and no [illegible] edema of the discs [illegible]

From [illegible] he made good progress, the urine showed no more casts or blood [illegible] as clear of albumen on *April 21*

S[illegible] ure was never above 140 mm

The [illegible] gradually increased until he returned to ordinary full diet

Urine after the first two days averaged 60 oz to the twenty-four hours

On M[illegible] ter thirty five days in hospital, he was discharged to duty, feeling and looking perfectly fit

This case is of interest as it shows (1) How completely he recovered after a very severe attack of acute nephritis complicated with uremia and (2) the antidiuretic effect which atropine has in œdema of the lungs as, but for its administration the patient would certainly have been suffocated

Chloroform might have been better to use to check the uremic convulsions but was not used on account of the syncopal condition of the patient

I [illegible] to thank Surgeon Commander C V Griffiths, D S O, for the able [illegible] since I [illegible] rendered during the uremic condition of the patient

(2) Treatment of Catarrhal Jaundice

Weil (*Bull et Mém Soc Méd des Hôp de Paris* May 27, 1920) recommends drop rectal injection of the following solution —

| | | |
|---|---|---|
| Urotropin | 1 5 grm | (22 gr ) |
| Sugar | 45 " | (11 drm ) |
| Boiled water | 1 0 litre | (35 oz ) |

I have found that the same result can be got by giving a simple enema in the morning to clear the bowel and one third of the above mixture as an enema to be retained at 9 a m , 2 p m and 6 p m

It is seldom necessary to continue this treatment for more than a week or ten days—but this depends on the severity of the attack When the urine returns to the normal colour I discontinue the enemata—

In severe cases I find that of creosot 3 minims in capsules given t d s by the mouth after the fifth day in addition to the enemata gives good results

During the treatment the diet should be as light as possible, with a minimum of milk and no eggs

The above treatment materially shortens the illness restores the digestive functions and rapidly removes the depression which so often accompanies jaundice It is the best treatment I know and in no case has there been difficulty in carrying it out

Weil states that the treatment fails in cirrhosis and new growths of the liver In one case I had of hypertrophic cirrhosis of the liver, this treatment reduced the jaundice I have not had a case of new growth in which to try it.

Mild cases of N A B jaundice have been treated and cured by these injections In the majority of the cases treated van den Bergh's (bilirubin) test had been carried out and an indirect reaction resulted, suggesting that the so called catarrhal jaundice was non obstructive in nature

(3) One day Treatment for Scabies

Dr Svend Lomholt in the *Lancet* of December 18 1920, p 1251 fully describes the treatment of scabies in the Danish Navy

Since reading this article I have been using a modified form of Dr Lomholt's receipt which works out at contract rates at 8d per lb Preparation of the ointment —

(1) 2½ lb of sulphur sublim are dissolved at a gentle heat in 5 lb of an aqueous solution of caustic soda containing 1¼ lb of this alkali This makes a clear solution

[illegible] Lanolin [illegible] nortar acid [illegible] sulphur [illegible] in soda [illegible]

(3) Flosh zinc hydr [illegible] by mixing 9 [illegible] of [illegible] sulphate and [illegible] of a 20 per cent solution of [illegible] soda this is filtered and added to the [illegible] which is then made up to a total weight of 20 lb by the addition of [illegible] water

(4) About 3 drm of essential oil of almonds are added to [illegible] the odour

*Method of Application*—The patient has a thorough hot bath [illegible] himself and rubs the ointment well into the affected parts and the neighbourhood if the back is affected this is rubbed by an assistant The patient then stands until his body exposed for fifteen minutes to allow of the escape of the sulphuretted hydrogen which is generated by the application of the ointment to the skin He then puts on a shirt or pyjamas and goes to bed where he remains for twenty four hours then he has another bath, puts on clean clothes, and he is cured

In none of my cases has any dermatitis developed or any ill effects been seen from the sulphuretted hydrogen, and there have been no relapses when the treatment has been thoroughly carried out, though hard rubbing is not necessary

In any of H M ships fitted with a steamer capable of disinfecting clothing and bedding this treatment can be easily carried out, and so save the necessity of sending cases of scabies to hospital

This ointment keeps well

I have to thank Mr J Innes, M P S, Superintending Pharmacist at Haslar for valuable suggestions and the preparation of this ointment

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## THE VALUE OF EOSINOPHILIA AS A DIAGNOSTIC FACTOR

By Surgeon Rear Admiral Sir PERCY RASSFIT SMITH K C B, C M G, F R C P F R C S D T V & H R N (Retd)

The importance of a properly made and stained blood film as a diagnostic factor, is often not fully appreciated K Gordon states that the quality of the blood cells present rather than their quantity is most important clinically If there is an increase of the polynuclear cells we look out for coccal infections if lymphocytes then an excess of some toxic agent—most often of bacillary origin if mononuclear then protozoal parasites so also does an eosinophilia give strong indications of particular infections which are here discussed.

A drop of blood should be taken from the peripheral circulation preferably from the finger the first drop being rejected and no undue squeezing employed This is spread on a slide as a thin film having a free border on one side and ending abruptly so as to give a thick area at one end for the detection of large parasites such as filaria.

It should be stained by some form of Romanowsky Leishman Wright Jenner or any other method that will bring out distinctly the oxyphilic granules of the eosinophiles which are then easily distinguished from the polymorphs In normal blood they should not exceed 3 4 per cent. of the total white cells according to Gordon their relative number varies from day to day in the same case—within narrow limits

These eosinophilic cells are as is well known in temperate climates, found to be increased in a certain number of pathological conditions

Ehrlich demonstrated a constant increase of eosinophilic cells in forms of leukaemia these are generally large in size and contain round or oval nuclei not divided as in the normal eosinophilic cells Müller and Gollasch demonstrated a considerable increase of eosinophil the cells in the blood of asthmatics and in the sputum they are also very abundant Müller and Reider found them increased in

children as [illegible] with or without splenomegaly Neusser observed an astonishing increase in eosinophiles in lupus so in other skin diseases The increase is not only absolute but also relative the normal being from 100 to 200 per c.mm Ren[illegible] and 10 000 in a case of lymphosarcoma of the neck Muller and Reh[illegible] 10 per cent in a case of ankylostomiasis, and at the same time demonstrated Charcot's crystals in the fæces but an increase was also noticed in other helminthic infections—oxyurides ascarides, and tænia Thayer found 58 per cent in cases of trichiniasis In post febrile conditions an eosinophilia up to 10 per cent may be found for a short time, as also after injections of tuberculin In malignant tumours there is often an increase particularly with the sarcomata, and it is interesting to note that in cases of that severe form of Hodgkin's disease of the Pel Ebstein type an eosinophilia may be very marked In almost all cases of scarlet fever from the third day to the second or third week, there is an increase from 8 to 15 per cent in nickots Hook and Schlesinger found from 3 to 20 per cent. Skin infections with sprotrhix organisms increase the count and certain drugs and chemicals do the same

These conditions as found at home, we need not mention further but when we get a patient from abroad showing a definite eosinophilia which cannot be explained by the presence of such conditions to which attention already has been drawn we must see the knowledge which has been obtained in Tropical Medicine and any information as to the geographical source of the trouble will be of very great importance The most common tropical and sub tropical causes are infections with ankylostomes, schistosomes and other intestinal parasites, filaria and some forms of Leishmania If the case has come from Egypt West Indies tropical America or India, and shows a more or less intense anæmia with œdema shortness of breath, palpitations physical and mental deterioration also a low hæmoglobin content and an eosinophilia the fæces should always be examined for the ankylostome ova These are oval, thin walled, with a wide, clear zone around the more or less segmented granular central portion The blood shows definite changes—red cells 2½ 3 millions, hæmoglobin low white cells fairly normal in number, but the eosinophiles 13 35 per cent

Schistosomes and bilharzia infections are found in cases from Egypt South Africa, West Indies, and lately in academic centre has been found in South Portugal These infections give rise to vesical hæmaturia or rectal disease due to the deposits of the ova in the mucous membrane and to secondary irritation ulceration &c The ova are readily detected and are large—100 to 175 × 60 microns—the vesical having a terminal spine and the rectal a lateral one these are respectively *Schistosomum hæmatobium* and *Schistosomum mansoni* The amount of eosinophilia varies from 0 to 65 per cent Christopherson states that in old standing cases the eosinophilia, though present is less well marked than in early cases owing probably to the body not reacting to the infection having immunized itself more or less The ova in severe infections may be found in the brain and spinal cord When in the urine this should be diluted with water, dilution 1 to 60 at a temperature of 130° F then the free swimming larvæ escape and are easily seen, and proof is obtained whether the ova are alive or dead

There is a third form found mostly in Japan and China known as Katayama disease the ova are oval with a minute tubercle but no spine They are deposited in the intestinal mucous membrane abdominal organs and brain In cases coming from China giving a history of having done a good deal of wading in lakes, ships shooting &c and having had an irregular fever marked orbital rashes headaches, general loss of vigour and intestinal or pulmonary symptoms, the disease should be suspected If a high eosinophilia is present—30 to 60 per cent—the diagnosis is fairly certain—but the characteristic ova should be looked for in the stools I have followed the courses of many of these cases for long periods and noted that the eosinophilia continued for years, even after all

[illegible] had passed [illegible] October [illegible] reported an [illegible]

[illegible] cases con[illegible] their blood shows [illegible] clear [illegible] with [illegible]

[illegible] for particularly [illegible] of ascaris, [illegible]

[illegible] and should [illegible] Cameroons Old [illegible] Nigeria [illegible] has been [illegible] attacks of fever [illegible] called [illegible] swelling. The blood [illegible] eosinophilia at [illegible] care. Filarial embryos may be [illegible]

The following [illegible]

Landed [illegible] Cameroons (1911) was under treatment [illegible] 1911 —

*Case 1*—

| Date | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
|---|---|---|---|---|---|---|---|
| Aug. 3 | 18 | [illegible] | [illegible] | [illegible] | 1 | M[illegible] | [illegible] |
| Sept. 1 | 31 | 1 | 17 | [illegible] | 1 | [illegible] | |
| [illegible] 1 | 1[illegible] | [illegible] | 20 | 1 | [illegible] | | |
| Nov. 1 | 3[illegible] | [illegible] | 28 | 1 | [illegible] | [illegible] | [illegible] |
| Dec. 1 | 3[illegible] | [illegible] | 24 | [illegible] | 1 | [illegible] | |
| [illegible] 18 | 3[illegible] | [illegible] | 18 | 1[illegible] | [illegible] | [illegible] | [illegible] |
| Jan. 1 | 3[illegible] | 1 | 22 | 3 | [illegible] | [illegible] | |

(Filarial [illegible] swellings but no [illegible])

*Case 2*—

| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
|---|---|---|---|---|---|---|
| Aug. 3 | 40 | [illegible] | 11 | [illegible] | [illegible] | malignant [illegible] |
| [illegible] 1 | 47 | [illegible] | 21 | 11 | [illegible] | |
| Sept. 3 | 47 | 3 | 16 | 11 | 1 | |
| 24 | 46 | 3 | 12 | 18 | [illegible] | [illegible] |

(No entozoal parasites were found [illegible])

Case 3 Served in the British Expeditionary [illegible] in 1916 under treatment in hospital in 1916

When received his blood showed a very high eosinophilia [illegible] and period of lumbar swellings Quartan and subtertian malaria [illegible] found in his blood and he had also a high grade infection of [illegible] which showed cyclical outbursts—once as high as 1,000 per [illegible] found to vary inversely with the eosinophilia which frequently rose [illegible] per cent

[illegible] nophilia [illegible] first fom [illegible] ll present [illegible] a mature [illegible] due to the [illegible] persistent [illegible] the malaria, the [illegible]

It [illegible] ched, at least as reported [illegible]

In [illegible] been found so, for instance [illegible]

An [illegible] case of Sudanese parasites in [illegible] mass of Balfour and Th[illegible] growth [illegible] 27 7) [illegible] eosinophiles while in the [illegible] 3 2 per cent

I have [illegible] phila up to 12 per cent [illegible] cases who with or without [illegible] show the presence of Lamblia flagellates or cysts in the fæces [illegible] that the presence or absence of these parasites should always [illegible] in a case of the blood change

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## HÆMATOMA OF THE NASAL SEPTUM

By Surgeon Commander A. B. MARSH, B.A., R.N.

THE following two cases of hæmatoma of the nasal septum from trauma are of interest from a diagnostic point of view the condition having been overlooked before the cases were sent into hospital

*Case A.*—T. S., apprentice, aged 13, whilst playing football received a blow on the nose from an opponent's elbow. He attended the sick bay after the injury, the nose being considerably swollen and both sides obstructed, a condition of purulent rhinitis was diagnosed, temperature normal. On admission into hospital both nostrils were found to be completely obstructed by a swelling of the mucous membrane of the septum, hæmatoma of the nasal septum was diagnosed and a free incision made on either side of the septum, a considerable quantity of pus was evacuated. A small gauze drain was inserted into the incision for twenty-four hours and the nares plugged with gauze soaked in 5 per cent. menthol paraffine.

Next day the gauze drain was removed and the cavity between the mucous membrane and the nasal septum syringed by means of a small silver catheter and bulb with peroxide solution, followed by saline; the gauze drain was then left out and the nares replugged.

The original incision in the most anterior and dependent part of the swelling was opened daily with a probe and clear fluid expressed for about three days. This latter method of treatment is better than keeping a drain in the incision, the object being to compress the mucous membrane against the septum by plugging the nares. The mucous membrane will be found to remain thickened for several days.

*Case B.*—Lieutenant X., aged 22, whilst boxing, received a blow on the nose. There was considerable swelling and bruising of the parts, which were very tender to touch, with obstruction of the nose. The patient attended the sick bay for some

[illegible] mperatu re [illegible] the lowest [illegible] vmentated [illegible] the lower [illegible] should [illegible] is from [illegible] s ori ul soon [illegible]

[illegible] -Case A night [illegible] the nasal polypi [illegible] th [illegible] a probe could be pass [illegible] ich could not be done [illegible] A careful examinati [illegible] al speculu n will at [illegible] r the diagnosis when th [illegible] ill appear bulging and fl [illegible]

[illegible] should be opene [illegible]

[illegible] tum from the lore [illegible] compressed and invari [illegible] ting seps a [illegible] ched and torn either [illegible] e from the nasal bones [illegible] r [illegible] l cular plate of the ethmoid inferiorly from the vom [illegible] al palat l processes of th superior maxil lary bones The mucous m [illegible] ane at the same tim [illegible] ines completely separated from the septal cartilage from effusion taking place between the mucous membrane and the septum which soon becomes septic leading to necrosis of the septum

Dangers are meningitis and pus sacking into the nares may infect the adjoining sinuses, *e g*, frontal, sphenoidal ethmoidal and finally the antra of Highmore

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## A CASE OF HYSTERICAL CONTRACTURE OF ELBOW JOINT

By Surgeon Lieutenant Commander T D S Higgins M B R N

An ordinary seaman, T G aged 19, joined H M S *Barham* on January 4 1933 Owing to illness—disease of intestines—he reported on the same evening at the Sick Bay where he was cared for on the sick list until p m January 6, when he was discharged to duty On this date the *Barham* sailed from Portsmouth where she had remained alongside during Christmas leave period It will be noted that the patient returned to duty in the middle of clean-ship routine and in a new ship No doubt he had been more comfortable in the warm and peaceful Sick Bay

On Monday January 8, he was seen by me in the Sick Bay his right forearm was fixed at an angle of about 90° to upper arm *History*—No injury had turned in all right on previous night and woke up with arm as above could give no reason for it and was obviously puzzled by it malingering excluded *Diagnosis*—Hysterical contracture

*Treatment*—(1) Endeavoured to help patient move joint at once by taking hold of arm explaining to him that it could be done and applying slight force for a moment RESULT—Produced only pain (2) Distracted patient s attention by *simultaneously* asking him to (*a*) look heedfully at another person (sick berth petty officer) (*b*) clench left hand hard (*c*) reply to questions spoken into right ear by medical officer standing alongside him RESULT—Arm was fairly easily manipulated through an angle of about 20 in about two minutes, without pain and without patient being aware of it Movement was very gradual, and was

halted the moment any resistance was felt. When questions were most insistent or most to the point, only stole a march of half an inch or so.

At this point nothing further was attempted. Patient was informed that he might man might in a morning when, at a quarter past ten the arm would be in the splint for the remainder he might remain in the Sick Bay. At 9 p.m. the same evening patient was seen again for a moment and again informed in a special manner that his arm would be moved quite freely at 10.15 a.m. next morning.

(3) On next morning, at the stated, patient was brought into the operating theatre. A new apparatus had been previously rigged, so that a fairly good spark was forthcoming. Patient was placed 3 ft. away from the tube and told to [illegible]. Medical officer stood by patient with his left hand loosely on patient's right shoulder. In the palm of his medical officer's hand was a cork through which the point of a surgical needle projected about one sixteenth of an inch. The [illegible] medical officer looked at his watch and said loudly "one fifteen." At [illegible] the arrows were switched on and patient's elbow was picked lightly [illegible] the cork (which he had not been allowed to notice). Patient [illegible] straighten the arm. He hesitated a moment when [illegible] to do so, it came. Result.—Patient immediately [illegible] full extension was made to look at it and then to rapidly [illegible] flexion and extension. He was discharged to duty.

Note.—It is commonly thought that the secrecy of above suggestion depended to a great extent on the fact that he was the stiff arm it was never allowed to "get [illegible]" with the exception that his arm could not move.

I wish to express my thanks to Surgeon Commander W. W. Kerr, C.M.G., R.N., for permission to carry out the above treatment and to publish this case.

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## A LIGHT AMBULATORY SPLINT FOR FRACTURE OF LEG

BY SURGEON LIEUTENANT COMMANDER J. P. S. HUGHES, M.B., R.N.,

AND

[illegible] LIEUTENANT COMMANDER G. B. ALLEN, R.N.

On [illegible] Able Seaman R., aged 37, H.M.S. *Barham*, was [illegible] sustained an injury to the right ankle. The [illegible] his foot in the points of the railway line [illegible] their dark to his ship. This caused him [illegible] points. The ankle was [illegible] found to have sustained a [illegible] of the internal malleolus. There was [illegible]

[illegible] a back splint with footpiece was applied and side [illegible] violent swelling or painful reaction had [illegible] suitable one for early massage and movement. On [illegible] ankle measured and this was [illegible]

In the [illegible] I could have a splint made up that would take the arms right direct from the condyles at the knee to the groined [illegible] which that would be weight being sustained by patient's [illegible] allowed to walk about daily with general benefit to his [illegible] the ankle joint.

The essential [illegible] splint was that it should fit at the knee and take the weight through the [illegible] the groined [illegible] the foot an inch or so clear of the groined. A simple wooden [illegible] convenience for attachment of foot and dressings but was not to carry weight.

I went to Engineer Lieutenant Commander Allen with the above rough suggestions and asked him if he would be kind enough to consider the notion from a practical point of view, and if possible provide a light splint. The splint shown in the photographs was completed before I was ready to use it. It was applied on November 21 and the patient used it and walked about quite comfortably. From that date he used it night and day—the splint being removed at bedtime, the ankle resting between sandbags during the night. The three guide rods (A) of the splint were shod with rubber and tested very comfortably over [illegible] years no further painting being required. The bands (C and D) of splint were also rubber shod preventing them slipping on or tearing shellac or deck surface.

The patient was discharged to duty for leave on December 3 after twenty days' sickness and walked ashore the splint having been discarded on the previous day.

It is submitted that the above treatment might be considered for other fractures below the upper third of the [illegible]. If an extension needle [illegible] could be used by bandaging the foot down to a frame [illegible] further below the foot than in the present model, the upper fragment being held in position by bandaging round the side bars.

I have asked Engineer Lieutenant Commander Allen to read the notes of the splint below. I am indebted to Surgeon Commander W. W. Kerr, C.M.G., R.N., for permission to carry out the above treatment and to publish the case. I should like to express thanks to Sick Berth Petty Officer J. W. Friend, R.N.

[illegible] diameter [illegible] roughly [illegible] to the shape of [illegible] provided by [illegible] band (of the [illegible] girdle) fixed at the reg[illegible] by the solepiece [illegible] back strap [illegible] also of [illegible] tech

(3) [illegible] members of the st[illegible] together the side bars being flatt[illegible] necessary, and as sh[illegible]

(4) [illegible] was made [illegible] under treatment but some provision [illegible] application to ol[illegible] by varying the thickness of the rubber pad which is fixed to the [illegible] the knee girdle

(5) The weight of the complete splint, which [illegible] is from materials available on board is 5 lb 12 oz

## Reviews.

HINTS TO PROBATIONER NURSES IN MENTAL HOSPITALS By Richard Eager O B E, M D Aberd London H K Lewis and Co Ltd 1912 Pp 80 Price 1s 6d net

We find some difficulty in reviewing this book The author's wide experience and the practical interest he has for many years taken in training those engaged in mental nursing are a sufficient guarantee of the soundness of the teaching he offers, in these eighty pages to *entrants* on mental hospital practice The forty three pages devoted to elementary psychology are valuable for their lucidity and for the apposite similes by which the subject matter is explained we have ourselves found them of service nor for the purposes of the book is it any hindrance that some of the doctrines enunciated may not be accepted by all psychologists Their purpose is probably to excite at an early stage the probationer's intelligent interest in his or her work—a wise and commendable aim More, we think might have been attempted to bring home to the nurse the bearing of these psychological considerations upon daily dealing with the patients, and upon his or her function in relation to the medical officers We think, too that some of these lessons might with advantage have preceded the presentation of the Rules which though their soundness is guaranteed by their authorship, have, in our view, been conceived and set out far too much from the custodial aspect or else that the four introductory paragraphs might have been expanded so as to emphasize to the probationer that she has come to a hospital in the right and best sense of the word What, for instance, are likely to be the feelings of one who aspiring to become trained in mental nursing and assuming she is of the right type, is at once confronted with as in Rule 1 'Never strike a patient' ? Nor do we like, in the next rule the choice of the word tackle Though other examples could be cited from the dozen rules propounded these two will serve to illustrate the feeling we have expressed and our hesitation to recommend this little book excellent as it is in many ways as a primer in mental nursing until in a future edition it has been somewhat recast

[illegible]

[illegible] the p[illegible] differe[illegible] appeal [illegible]

The [illegible] responsi[illegible] and tropic[illegible] their caus[illegible]

The [illegible] brevity. This [illegible] however [illegible] of the book [illegible] ally happens in a textbook [illegible] subject, [illegible] is merely [illegible] All the latest ideas are [illegible]

The Section [illegible] Diseases of the Circulatory S[illegible] for which the Editor is chiefly responsible is particularly thorough and is [illegible] illustrated with electro cardiograms.

This book can be thoroughly recommended to medical officers for reliable reference and so far as can be judged, there are no important facts which will not be found. The index is full and very clearly printed for easy reference.

It is a great pity that the inner margins of the pages are so narrow. It is almost impossible to read the words near the bound edges.

G O M D

MALAY POISONS AND CHARM CURES. By J. D. Gimlette, M.R.C.S., L.R.C.P., Residency Surgeon of Kelantan. London: J. and A. Churchill, 1923. Pp. 260. Price 8s. 6d. net.

In this, the second edition of Dr. J. D. Gimlette's book on Malay poisons and charms, the increase in size has been considerable from 127 to 260 pages. The expenses are promised by the Committee of Malay Studies of Raffles College, Singapore, and it has been recognized by the Government of the Federated Malay States.

Two of the "medicine men" of the royal household of the Sultan of Kelantan rendered very great help with information on charms and black art. The book covers a wide field and describes methods of poisoning, charms, spells, black art, character of poisons from fish, reptiles, &c., jungle plants, herbs and inorganic substances.

There are also three useful appendices. Sir W. H. Willcox has written a foreword and he speaks very highly of the work done and the way in which the author has placed the subject before us. The net result of the book is to show what an enormous number of potent poisons are habitually in use and of which a scientific examination might render many of them very helpful to man. Some of the ideas held are interesting and curious. They say that disease is sent from God and it springs from the elements fire, air, earth and water. Some of their views with regard to medicine were advanced—for instance, the Malays considered

that [illegible] the practice of direct suillipox inoculations [illegible] 1904 which was made a penal offence. Of the [illegible] poisons there appears to be no end, and the danger [illegible] ly too common. The author points out that fright [illegible] ing, and crime are mixtures of many substances [illegible] ds drober and datura are the most effective. [illegible] Herbal of death by sleeping under a upas tree [illegible] though [illegible] in the milky sap is much used for arrows and [illegible] the juice [illegible] be applied to the unbroken skin or taken by the mouth [illegible] danger.

Dr G [illegible] congratulation [illegible] having compiled this most interesting and informative [illegible]

P W B S

MEDICAL AXIOMS, APHORISMS AND CLINICAL MEMORANDA. By James Alexander Lindsay, M A, M D, F R C I, Professor of Medicine in the Queen's University of Belfast. London: H K Lewis and Co, Ltd. 1923. Pp xiii + 61. Price 6s net.

In this book the author has collected the medical axioms, aphorisms and clinical memoranda which he has found have been familiar to several generations of students of the Belfast Medical School.

While each medical school probably has its own axioms and aphorisms that fall from the lips of its teachers and which the students may, or may not carefully take to heart, it is not little useful to have them in book form especially when they come from such a fine teaching centre as Belfast. The author divides these headings first into General then into the various Systems, Miscellaneous and finally Philosophical. The quotations from the great observers of the earliest times such as Hippocrates and Celsus down to modern clinicians such as Osler and Clifford Allbutt. The reader will find many useful hints in this book applicable to all forms of practice.

THE BIRTH AND EARLY DAYS OF OUR AMBULANCE TRAINS IN FRANCE. August 1914. By Colonel G A Moore, C M G, D S O, M D, Deputy Chief Commissioner St John Ambulance Brigade. London: John Bale Sons and Danielsson Ltd. 1922. Pp 24. With five illustrations. Price 1s net, by post 1s 2d.

This pamphlet commences with the mobilization of six trains, every each composed of two officers and forty five N C O s and men of the Royal Army Medical Corps and tells how on August 17 1914 the first Army ambulance trains were improvised from miscellaneous French rolling stock. The pamphlet carries us right through to the time of the Armistice when fifty completely equipped British made ambulance trains were in service in Belgium, France and Italy.

Colonel Moore tells his story with an enthusiasm that sustains the reader's interest from first to last. It is a tale of difficulties overcome and fine achievement that will have many appreciative readers especially among those who helped to perfect the service, those who worked in it and those who gave their lives to the safe and comfortable conveyance of the ambulance trains.

THE SURGICAL DISEASES OF CHILDREN. A Handbook for Students and Practitioners. By Frederick C Pybus, M S, F R C S, Assistant Surgeon Royal Victoria Infirmary, Newcastle on Tyne, late Surgeon to the Hospital for Sick Children, Newcastle on Tyne, Hunterian Professor Royal College of Surgeons of England, &c. Pp xiii + 408, with 288 illustrations. London: H K Lewis and Co, Ltd. 1922. Price 18s net.

This book does not pretend to be a complete treatise on the subject of the Diseases of Children but rather a record of personal experience of the commoner

conditions [illegible] the surgical side of children's hospital Although many of the articles have previously appeared in the [illegible] *Children's Diseases* the [illegible] and other papers the book is systematically arranged in sections [illegible] a more collection of articles on various [illegible]

The opening chapter on Examination and General Treatment—is particularly interesting [illegible] much sound advice The dangers and prevention of antiseptic [illegible] in fact it may now be mentioned that cleanliness is an outstanding [illegible] of the whole book

Congenital [illegible] injuries deformities cysts and tumours acute infections tuberculosis [illegible] syphilis abdominal affections diseases of the rectum genito urinary diseases surgery of the head throat nose and ear are the headings of the various sections and this comprehensive list contains an account of every condition likely to be met with in general practice

The various operations are not always described in elaborate detail but the main objectives are clearly stated and after treatment is not neglected

The book is obviously written by one accustomed to teaching and the numerous illustrations are evidently chosen with the sole idea of imparting knowledge These illustrations are mostly from photographs and are clear and instructive The style of writing is decisive and space is not wasted with argument and theory The print is clear and the very comprehensive and well arranged index shows the enormous amount of material contained in the 400 pages of the text

This is a book which fills a gap in surgical literature, and can be recommended as sound in principle and practice G O M D

# News of the Service.

## BIRTH

BRETON —On February 14 1933 at 10 Bembridge Crescent Southsea to Armarel wife of Surgeon Commander W K D Breton, R.N of H M S *Excellent*, a daughter

## DEGREES AND DIPLOMAS

Surgeon Commander Hugh F Briggs was successful in obtaining the Fellowship of the Royal College of Surgeons Edinburgh at the Examination held in January 1933.

## PROMOTION

Surgeon Lieutenant George Aubrey promoted to Surgeon Lieutenant Commander dated January 24, 1933

## ROYAL NAVAL MEDICAL COMPASSIONATE FUND

At the Quarterly Meeting of the Directors of the Fund held in January 3 two cases were considered and £15 voted to the applicants The following is a summary of the cases relieved —

Daughter aged 60 of surgeon in Royal Navy who died in 1906 Is unable on account of paralysis inflicted by medical malfeasance to do any work Is in receipt of a grant from the Naval Benevolent Society and from the Naval Compassionate Fund also has a part interest in a bearing bonus Voted £20

Wid[illegible] —he died in 1876 [illegible] totally [illegible] Estimate Fund [illegible]

[illegible] Navy who have [illegible] Subsi[illegible] Fund Medical [illegible]

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## ADMIRALTY ORDERS ISSUED FROM NOVEMBER 15 1922, TO MARCH 15, 1923

(Only the more important Orders pertaining directly to the duties of the Medical Officer afloat and on shore are included.)

### 3361.—R N Hospital Gibraltar—Closing

(N 1056/6 22.—15 12 1922.)

Orders have been issued for the closing of the R N Hospital Gibraltar

(2) The Military Hospital at Gibraltar will receive all cases of illness or injury, naval and military, who have received treatment in the Naval Hospital at Gibraltar, including cases of [illegible] of the among Spanish workmen that may be dealt with at the Dockyard Surgery

(3) Under [illegible] the Military Hospital will be in the entire medical charge of the Army Medical Officers at the Military Hospital and Naval patients will wear the usual military hospital clothing

(4) A Naval Medical Officer is appointed to H M S *Cormorant* as Limited Medical Officer with the [illegible] Director of Medical Services in charge of the Military Hospital at Gibraltar

(5) The Military Hospital will deal only the cases sent to it by the Limited Medical Officer [illegible] Medical Officer and by [illegible] who should be consulted by ships calling at Gibraltar [illegible] cases as to their transfer to the Military Hospital

(6) Army Dental Corps Officer will attend to the necessary dental treatment of the [illegible] in attendance at the Military Hospital

### 3462.—R N Sick Quarters South Queensferry—Change of Title

(C E 1028/22.—22 12 1922.)

The Establishment now known as the R N Sick Quarters, South Queensferry, is in future to be designated "The R N Hospital South Queensferry."

### *340.—Medical History Documents Procedure

(N 1057/9 22.—9 2 1923.)

A revised procedure for dealing with Medical History Documents has been approved and is promulgated as a revised Article 1510 Kings Regulations and Admiralty Instructions in R R [illegible]

The following are the documents to be kept in the cover:—

Medical History Sheet (S.446 late M 160)
Syphilis Case Card (S 576)
Dental Card (M 32)
Other documents such as Radiograph and Ophthalmic Reports also References should of an important nature bearing on the Medical History of the man

Like the Service Card Jacket cover the Medical History Document cover (S 446A) referred to in [illegible] of the revised Article is being printed in three substantial leaflets handling and the [illegible] for demanding and using the cover will be identical with that shown for Service Card [illegible] in A R O 794/22

[illegible] the cover has been introduced to prevent loss of Medical Documents and [illegible] only those documents which are necessary for continuation of a case [illegible] and that the cover itself should not be sent from ship until the [illegible] discharged therefrom

[illegible] References to Medical Documents will be removed from the Service Card Jacket cover as [illegible]

[illegible] change the Medical History Sheet has been renumbered S 446, [illegible] S 446 shall be [illegible] Existing stocks of the latter should be used with [illegible] for transit and postal purposes

(*A R and I T Art 1370*)
(*A R O 3/23*)

(*This Order is [illegible] for posting on Notice Boards.*)

**373.—North Persian Forces Memorial Trust Fund**
(C.W. 2[illegible]—9.3.1923.)

[illegible] Fund has been instituted in commemoration of the service [illegible] Fund has been subscribed by officers of the Royal Army Medical [illegible] who served with the Persian Forces.

[illegible] with the object of the trustees to encourage the study of [illegible] Memorial should take [illegible] Medal [illegible] Medical Corps, Royal Army Medical Corps, Royal Indian Army Medical Corps, [illegible] Medical Service.

[illegible] will be the last paper published during the twelve months [illegible]

[illegible] mentioned in the latter part of the year following that in which the paper was published [illegible] that the Memorial Committee consider the papers published shall [illegible] attained a standard deserving an award.

Medals [illegible] will be awarded for this Medal should forward their published [illegible] through the usual channels.

**388.—Eyesight Tests of Rangetakers, &c.**
(N. 1028/22.—16.2.1923.)

In future the Officers and ratings specified will be required to pass eyesight tests [illegible] the table attached. The initial tests are to be passed only by future candidates for [illegible] ratings.

2. The initial test is to be passed before the qualifying course for a rating, and [illegible] confirmed gunnery rating is to be given until the Initial Eyesight test has been passed. In exceptional cases where for any reason it is impossible to apply the [illegible] a date, the rating may be given officiously provisionally until the [illegible] an opportunity occurs for him to undergo the Initial Eyesight test, when [illegible] the grant of the rating or confirmed rating is to be antedated to the date [illegible] immediately preceding the date.

3. Initial tests may be carried out in the following ships and establishments:—

Rangetakers (Stereoscopic) Rangetakers (Monocular) Director Layers and Gunlayers
R.N. Hospitals at home and abroad
Hospital ships
Naval Quarters and Depots (three Home Ports)
H.M.S. *Excellent*
* Any doubtful cases to be referred to the R.N. Hospitals at the three [illegible] in the dominion.

Signal Boys
H.M. Training Establishment Shotley
Sick Quarters at Devonport Depot

The requalifying tests are to be held as follows:

Rangetakers (Stereoscopic)—
As in item (1) above.

Rangetakers (Monocular), Director Layers, Gunlayers and Signal ratings—
H.M. Ships, Naval Stations or Naval Bases.

Ratings volunteering for further service on a station in the event of a ship [illegible] abroad are to pass the requalifying test before being considered eligible for [illegible] existing non-substantive rating.

4. A Gunlayer who fails to pass the initial test for Director Layer [illegible] of the requalifying test must retain his existing non-substantive rating. [illegible] substantive rating as Officer qualifying as Director Layer fails to pass the [illegible] that he also be re-examined by the nearest Naval Ophthalmic Specialist. If [illegible] is confirmed as being due to a permanent visual defect the Officer [illegible] quish the duty and pay.

5. Signal Boys who fail to pass the requalifying test are to be [illegible] doses of training ashore Depots for [illegible] and other future employment [illegible] the Signal School.

6. The results of the various Eyesight Tests are to be noted on the [illegible] History Sheet as the case may be.

7. Gunnery and Signal Officers are to be regarded as responsible for [illegible] Officers and Ships are to be when [illegible] for Eyesight Test.

[illegible] the importance of the paper [illegible] meeting [illegible]

[illegible] Thus [illegible] object Resolution paragraph [illegible] No. 69/1919 [illegible]

| | | Test | | Test |
|---|---|---|---|---|
| | | | | *Increase the R.T.'s As in field test* |
| Rangetaker | [illegible] | [illegible] | [illegible] and [illegible] to higher [illegible] | Monocular R.T.'s and those who fail to recognize Stereoscopic R.T.'s (the latter are to be employed on [illegible] instruments [illegible] pass the test shown below) Right eye (which [illegible] is to use with range finder) [illegible] Vision [illegible] perfect [illegible] Stereoscopic type [illegible] of [illegible] or astigmatism to be corrected by at most a 3.0 plus or minus spherical or cylindrical lens or a combination. These lenses [illegible] without [illegible] lens. Left eye [illegible] not less than 0.12 |
| Gunlayer Director and Officers performing Director duties | [illegible] | [illegible] | Do every 3 years | Both eyes healthy. Vision not less than perfect [illegible] each eye tested separately. [illegible] of astigmatism to be corrected by a [illegible] plus or minus spherical or cylindrical lens or a combination [illegible] Normal colour vision. No [illegible] with or without correcting lens |
| Signal Branch Signal P[illegible] including Signal Boatswain | [illegible] | [illegible] | Every 2½ years | [illegible] Good [illegible] Normal field of vision. Perfect colour [illegible] |

(Sd.) [illegible]
(Sd.) [illegible]
(True extract from [illegible] Naval Boards)

*Face leaf matter*

# Notices.

The Editors invite Medical Officers to send [illegible] Papers on professional subjects and personal experiences [illegible] items of news and matters of interest to the Naval Medical Service [illegible] will be welcomed from ships and establishments on home and foreign stations.

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VOLUME IX. [illegible] No. 1

# Journal
of the
# Royal Naval Medical Service.

## Original Articles.

### X-RAY PROTECTION

By V. E. HULTIN
*Director of Radiological Research, Research Department, Woolwich*

It is essential from the Service point of view that protection for the operator and patient in all x-ray work should be thoroughly understood and all proper precautions rigorously observed. At the same time it must be realized that a certain amount of risk will have to be taken especially under active service conditions. It is however very desirable in home hospitals, more particularly where ordinaries are treated, that protective measures should be enforced and every possible care observed for the general and routine safety of all concerned. It is the purpose of this short article to enumerate x-ray and allied dangers as far as they are known, and to show in general language how they may be modified and to a more or less extent eliminated.

We will first consider the effects of the actual x-ray beam. The question of precautions to be observed in x-ray deep therapy will not be considered to any extent because it is not met with in Service practice. Service x-ray installations are almost entirely used for diagnostic purposes, which renders the question of adequate protection a comparatively simple one.

It should be pointed out that, however perfect are the mechanical, physical and electrical arrangements of the installation, yet the most important factor is the care and technique observed by the operator.

All x-ray phenomena, both useful and harmful, depend upon absorption of the rays by substances which are in the path of the beam. This absorption depends upon two factors: (1) the *wave length* of the radiation, by

[illegible] in [illegible] the distance [illegible] *density* of the absorbing material In general it may be [illegible] that the greater the density of the absorber, the greater is its absorbing power [illegible] treatment should be modified and the modification becomes important [illegible] filters It can be shown that some substances have a [illegible] power of absorbing certain definite wave lengths and therefore [illegible] of in absorbing filter will depend upon the composition of the [illegible] beam, and also upon the particular type of radiation we wish to emerge The differences in absorption of x rays by tissues are very well illustrated in an ordinary radiograph the more absorptive tissue *e g* bone, detracting from the intensity of the emergent x ray beam and throwing a shadow image on the plate All radiographs are mere contrasts in ray absorption depicted in the form of a shadowgraph The physiological action of x rays also depends upon absorption in the tissues, and x ray therapy in this same way makes use of this phenomenon

It will probably be of value to mention the more or less well known effects of x rays upon human beings before considering protection in any detail

The physiological action of x rays is only very imperfectly understood but of late years a considerable amount of investigation work has been [illegible] this has resulted in the acquisition of a mass of new information particularly concerning the dangerous effects on patient and [illegible] In the early days the immediate result of x ray practice was [illegible] skin, and workers nearly always developed the character [illegible] This long continued skin irritation resulted very often in the [illegible] growths which have been the cause of such a number of [illegible] the early workers

[illegible] may be regarded to a certain extent, as characteristic of [illegible] and less powerful x ray tubes The x rays produced were of [illegible] low frequency or long wave length, and were very easily [illegible] more superficial tissues and consequently the physiological [illegible] in that region Such was their insidious action [illegible] were taken work was carried on and the fatal effect [illegible] was very often only realized when it was too late [illegible] hot cathode x ray tube and noticeably the one produced by W D Coolidge in 1913 a much more powerful type of x radiation [illegible] use of hard or short wave radiation and big [illegible] were cut down by thousands of times materials of [illegible] thickness and density were radiographed and the use of x rays [illegible] extent before impossible

[illegible] was hest by very much increased danger [illegible] the diminutive which radiologists were beginning to know [illegible] which in protect themselves we were faced by other effects of a much more damning nature Deaths from anæmia occurred,

[illegible] were observed and various [illegible] were [illegible] by workers throughout the world It [illegible] that this new [illegible] harder radiation was not [illegible] by the skin but by the [illegible] tissues and the bone marrow [illegible] that the possible effects [illegible] much more serious and [illegible] more

Apart from the gamma rays [illegible] physical and [illegible] effects Gamma rays [illegible] very much more penetrating [illegible] rays having a very much shorter wave length The small [illegible] which is available however is very definite limit to the [illegible] of the radium for all practical purposes It is therefore practicable to use radium for the production of radiographs but [illegible] is restricted to therapy and [illegible] such [illegible] the scope of this [illegible]

A [illegible] on metabolism varies It is generally stimulating but in certain [illegible] instances it has a powerful sedative effect Certain individuals exhibit much greater sensitiveness to rays than others This is but part of the personal idiosyncrasy peculiar to [illegible] all world [illegible] appears [illegible] in sensitiveness according [illegible] tate

Cells which are actively dividing are shown to be more sensitive than others The selective action of rays and radium on cancer cells has been fully demonstrated Certain parts of the body are very much more sensitive to radiation than others for example the spleen and testes and [illegible] are extremely sensitive while bone appears to be very [illegible] Radium sickness is of course a very well known phenomenon [illegible] therapy Recent work in America has shown that acidity is [illegible] after radiation and it has been suggested that general [illegible] and symptoms may be due to acidosis With regard to blood [illegible] it would appear to be a matter of some uncertainty as to what [illegible] but it is impossible to attain any consistent pattern Prof [illegible] has done exceedingly valuable work in this connection and has [illegible] very interesting results notably radiating rats He has shown [illegible] diminution of lymphocytes follows even a very slight [illegible] and that this effect is more sensitive as a criterion of rays than [illegible] Russ experiments have been repeated by [illegible] in other animals with similar results The [illegible] appears to be as sensitive to radiation as the white certainly [illegible] redness but it is doubtful whether this holds in [illegible] only hard or penetrating radiation which appears to [illegible]

[illegible] it may be generally stated that leucocytes are reduced by [illegible] rays together with a relative increase in lymphocytes

[illegible] would appear to be generally a reduction in blood coagulation [illegible] after exposures Dr Clarence Stelhof states that it is [illegible] in normal subjects to one fourth by irradiating the spleen [illegible] rays on blood pressure does not appear to be very marked

[illegible] lower it. Low blood pressures have [illegible]

[illegible] has been investigated and results [illegible] by x rays. In the absence of any [illegible] conclusively shown.

[illegible] all the effects mentioned are due to x ray absorption. Clearly it dictates the methods to be adopted for protection. We must arrange apparatus in such a way that x rays only escape in the direction that is required and also we must reduce the amount of x rays so escaping to the very minimum consistent with good radiographs. We must arrange our radiation in such a way as to cut down exposure as much as possible. Remembering, that there is an optimum wave length to produce good result for various parts of the body, our technique in this respect is most important.

The thicker and bony parts of the body require more penetrating radiation than other parts. Consequently if exposures are to be reasonably short a higher voltage usually indicated by a bigger spark gap, is requisite.

In this respect it will be well to consider what happens when a beam of [illegible] is used to obtain a radiograph of a part of the body. The beam of [illegible] when leaving the target of tube is composed of impulses or waves of various frequencies. It is said to be heterogeneous. There will be a [illegible] short wave side of this beam depending upon the voltage. Although the voltage may be high and the short wave component of the beam very penetrating, there will also be a soft or long wave component which will be absorbed in the tissues and which will never reach the emulsion of the photographic plate. Therefore, for the purpose of the radiograph, this part of the total beam is valueless and at the same time its action on the patient is harmful. It is therefore desirable to use filters when hard radiation is required. A millimetre or two of aluminium will generally answer this purpose for all Service requirements. The function of the filter being to absorb the softest part of the beam which otherwise would be absorbed by the tissues of the patient. There are two considerations which apply to the use of filters in this way. A filter should only be used when radiographing very thick or densely bony parts demanding highly penetrating rays and it should not be thick enough to have any appreciable effect on the length of exposure.

It is also to be remembered that good contrasts depend to some extent upon the fact that the x-ray beam is heterogeneous, and therefore the absence of a filter may be an advantage especially when radiographing thin parts of the body, and it should not then be used. There is another factor which is important from the point of view of obtaining good radiographs and that is *scattering*. Part of the incident beam is as we have said, absorbed by the tissues; part penetrates them, emerges and affects the photographic emulsion and part of the beam is *scattered in all directions*, both during the passage of the beam

through the body and also at the *incident* and *emergent surfaces* This scattered radiation is of the same hardness as the primary beam and has the same properties Consequently it too will affect the emulsion and if present to any extent will effectually fog the plate and blur out any fine detail The only way to reduce scattering is to close down the diaphragm of the apparatus to the smallest aperture that will permit of good results

To consider now the question of actual protection for the operator and the patient From our point of view the physical properties of $x$ rays are in nearly all respects, the same as ordinary light, for instance the inverse square law holds as regards intensity An operator standing at a distance of two feet from an $x$ ray tube will get four times as much $x$ rays as if he was standing four feet away

Similarly to light, $x$ rays travel in straight lines the greatest intensity proceeding from the focal spot but $x$ rays are also generated in large quantities from other parts of the tube, especially from the back of the target and from its supports This is especially true in the case of a Coolidge tube The fundamental thing is to surround the source of radiation—the $x$-ray tube—with a highly absorbent material Metallic lead is far and away the best If the tube were really efficiently protected in this manner the use of lead aprons &c would be superfluous The Committee on $x$-ray Protection has recently made certain recommendations in this respect but the figures quoted are not in the opinion of the writer to be regarded as affording *complete* protection when working with the modern high power $x$ ray tubes

It is possible to detect radiation from a modern Coolidge tube after passing through metallic lead ⅛ in in thickness A comparatively thin sheet of lead say 2 mm-, will certainly absorb by far the greatest *amount* of the incident beam, but the part that is *not* absorbed though of small intensity, is the *most penetrating* and therefore the most dangerous part of the beam We should aim at absorbing *all* the radiation by the lead shield and though this is not possible, it is much safer to overdo protection than to minimize it

For radiography as practised in the Services, it is considered that $x$ ray tube boxes should be covered by 2 or 3 mm of metallic lead or its equivalent in absorbing power If an equivalent thickness of lead rubber is used for the purpose it must be borne in mind that this material not only varies very considerably in its absorptive power, but also it degenerates to a very marked extent with time and should be frequently retested

It is not sufficient that the $x$-ray tube should be partly encased in lead It should be *completely* enclosed As was stated above $x$ rays are generated in large quantities from all parts of the tube, and not only at the target If deep therapy is contemplated, then 3 mm of lead protection is not considered to be a safe amount of protection Screen

exam [illegible] the Services should [illegible] tend [illegible] poutics.

[illegible] and orderlies should [illegible] with the [illegible] [illegible] warned [illegible] ness which [illegible] [illegible] fund unity. [illegible] [illegible] firmly apparent.

[illegible] Three [illegible] [illegible] will very [illegible] [illegible] patient or operator should be [illegible]

[illegible] that the [illegible] of the electrical [illegible] [illegible] acts [illegible]

[illegible] when the [illegible] of [illegible] when an electrical [illegible] to flow. The greater [illegible] the current and the [illegible]

[illegible] X-ray equipment having [illegible] [illegible] construction [illegible] wall [illegible] [illegible] month and every [illegible] insulated. All [illegible] the Coolidge filament [illegible] the controls [illegible] possible one from [illegible] shock is not very [illegible] touched [illegible] [illegible] between them a [illegible] Such a circumstance [illegible] adjustable [illegible] and [illegible] the scale [illegible] shut off the power the conditions for serious [illegible] An attempt [illegible] the spark gap with a [illegible] the same result. These small things are all [illegible] foreseen. [illegible] meters should not [illegible] requiring measurement in this way should be [illegible]

[illegible] condition which may manifest itself with such an [illegible] for the Coolidge filament may be badly in-

sulated *e.g.*, the stand may be too small it may be made of conducting material or it may be wet. Such a condition has the effect of earthing one end of the high tension system. If a person in contact with earth touches the other end which is at a maximum voltage above earth a complete circuit is formed and current will flow. A very severe shock will result.

Assuming that such an x ray outfit as has just been described is properly arranged and all electrical details are good, then no very serious shock can result. If a person chances to touch the live high tension wire he will receive a momentary shock due to the electrical capacity of his body but the extremely high resistance offered by the earth, the insulation of the coil and himself precludes the possibility of any sustained current. The result may be unpleasant but it is not normally dangerous.

The other type of installation that is met with in Service practice is that including a closed core transformer. Such a generator is usually earthed either at one terminal or at the middle point. This fact together with the high power of the machine renders such an installation potentially very unsafe. Any person touching a live wire, and who is at the same time connected to earth, is in a position to receive a sustained current and the result may very well be fatal. Hence the need for extraordinary care in the arrangement and operation of such a set. The provision of safety devices and the question of protection from electrical dangers is a very difficult one and no hard and fast rules can be laid down. It is possible, however, to stipulate a few rules the observance of which will certainly minimize danger. The question as to whether or not it is advisable to earth all metallic parts of x ray apparatus is debatable. If the apparatus is earthed there is reasonable safety from shock, always assuming that the high tension system is properly designed. On the other hand a very definite danger is introduced. The other way of dealing with the difficulty is to thoroughly insulate the whole apparatus the patient and the operator. If this method is adopted and properly done serious danger is removed. A sense of security is induced, but if at any point the insulation fails and in such a contingencies we must consider then the danger is very serious because it is not anticipated. On the whole and as a result of considerable experience it is considered that the first alternative should be adopted and the danger which does still exist should be thoroughly explained to all concerned.

A few points in this connection are important. If possible two milliampere meters connected in series should be in every high tension circuit. Their readings should be identical.

Milliampere meters should not have two scales requiring adjustment but one fixed scale reading say from 1—90 ma.

Spark gaps should be fitted with a remote and insulated adjustment and should be readable in inches from a distance.

All main power switches should be of the double pole type.

All com[illegible] placed in such a way that the operator can command [illegible] during the running

The [illegible] of *all* high tension wires should be frequently [illegible]

[illegible] should be reduced to a minimum by using wires of [illegible] a large diameter say half inch The apparatus sh[illegible] in such a way as to permit of all high tension leads being short [illegible]

The writer has witnessed a practice of "testing" the hardness of an x ray tube by the operation of approaching the hand to the live wire and judging the hardness from the resulting spark Such practices should be rigorously suppressed

Rubber matting should be provided to be placed on the floor surrounding the x-ray apparatus in order to insulate the operator as far as possible

In view of the fact that severe electric shock—possibly followed by collapse—is always a possibility in any x-ray department, it is suggested that instructions should be posted up near the apparatus to the effect that in the case of such collapse artificial respiration should be immediately resorted to

The third problem connected with danger in x ray installations is concerned with ventilation In almost every case and certainly where much work is done, artificial ventilation should be installed It has been suggested that deficient ventilation is responsible for many of the reported constitutional symptoms in x-ray workers Certainly it is the experience of the writer that many severe symptoms complained of by people constantly employed on x-ray work have ceased when really adequate ventilation has been installed On the other hand it seems to be difficult to account for these ill effects Ozone of course is produced in x ray rooms which may have a decidedly prejudicial effect on health but some experiments that have been done suggest that this is not the only factor involved

Nitrous oxides are also produced, but in negligible quantities The third known factor is the ionized air, and it is not at all clear as to whether the inhalation of such an atmosphere has any very marked effect on the health The production of ozone and nitrous products are very much increased as the sparking of the system increases, and therefore corona discharge must be kept down Mention was made of this when discussing electrical dangers The importance of perfect ventilation in x-ray rooms cannot be too strongly insisted upon and the same must apply to the dark (developing) rooms These rooms are very often deplorably small and badly designed Heavy x ray work means that someone has to spend a considerable amount of time in the developing room The ventilation of this room is consequently important Its temperature is also important, not only from the hygienic point of view but also that photographic results may be good X ray rooms and developing rooms should preferably be painted a cheerful colour There is no reason whatever for the usual depressing black An

outline of general x ray dangers and protective measures has been given, but at the same time it is pointed out that every case should be dealt with on its merits, and frequent expert examinations of apparatus carried out

Persons who are constantly doing x ray work should be allowed ample holidays and frequent spells in the open air, and any complaints should be investigated before permitting continuance of the work It is also advised that blood counts should periodically be made and recorded together with each operator s history In the case of individuals who are only beginning x ray work, blood counts *before* their practical work commences are extremely valuable as a basis for comparison, and it is urged that this should be made a regular routine

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## SOME MEDICAL PROBLEMS IN CONNECTION WITH CHEMICAL WARFARE [1]

By Surgeon Commander G R McCowen O B E M D R N

I have no doubt misled many of you by the title of my paper "Some Medical Problems in connection with Chemical Warfare" into thinking that I would review the medical aspect of chemical warfare as it occurred in the late war, and prophesy what may have to be encountered in future wars In view of the fact that it would be a very courageous man who would venture to prophesy on such a subject and even though his prophecy were to come true he would be like Cassandra of old whom no one believed I have thought it more expedient not to emulate such seers into the future but to confine myself to a few of the ascertained facts which have become known as a result of the war and to indicate their application to peace time conditions

Before touching on these subjects a brief résumé of gas warfare as it occurred may not be out of place, bringing as it did almost new clinical conditions for which adequate treatment was practically unknown, thereby opening up vast fields of observation and new channels of research, and ultimately leading to more accurate methods of treatment, not only for sufferers from gas poisoning, but also for the more common conditions especially respiratory, which are closely related

Everyone will remember the first employment of poison gas by the Germans in April 1915 when chlorine gas was liberated from cylinders and carried down wind to the opposing lines This method of attack was gradually replaced by gas shell whereby a variety of poisons could be used, the direction of the wind could largely be ignored and a high

[1] Read at the Scarborough Congress of the Royal Institute of Public Health May 18, 1928

[illegible] target Phosgene [illegible] similar [illegible] immediate [illegible] the more [illegible] war

[illegible] during the war was in [illegible] and this may still be [illegible] purposes

[illegible] the whole of the respiratory [illegible] immediate danger with [illegible] associated with all the [illegible] of oxygen others such as [illegible] only after a varying [illegible] falls into two groups [illegible] venous engorgement [illegible] lips and tongue increased [illegible] pulse the other in [illegible] collapse rapid and [illegible] the difference in these [illegible]

[illegible] depleting as it does the [illegible] infiltrated and [illegible] In addition [illegible] of oxygen and carbon dioxide [illegible] only by its presence thereby [illegible] and its dangerous consequences [illegible] efforts must be directed to [illegible]

[illegible] within the twenty four hours [illegible] of the edema gradually sets [illegible] well established Bacterial [illegible] of the lungs, but [illegible] might be expected

[illegible] absolute rest and [illegible] infusion in selected [illegible] Though venesection is the first gas [illegible] before their utility was [illegible] physiol[illegible] for these methods of treat[illegible] investigated before the war and it was only as [illegible] cases that attention was focused on them and [illegible] closely related conditions met with in general [illegible] doubt I will also deal with this later

[illegible] damage initially done to the lungs, a very [illegible] the future of the unfortunate survivors It

[illegible] predicted that they would soon be totally disabled by [illegible] emphysema and chronic bronchitis and that the damaged lungs would form a suitable soil for the development of tubercle. Fortunately none of these gloomy predictions have been justified though it is true that a very few cases of pulmonary fibrosis with accompanying emphysema, which simulate superficially tuberculosis have been observed as a sequel. One can emphatically say in spite of much that has been written to the contrary in the lay press that gas poisoning is no more related to pulmonary tuberculosis than Midlothian was to Moses who claimed his descent because he could drop the middle and all the vowels.

There is a type of neurosis having signs and symptoms very similar to those occurring in cases of effort syndrome which is alleged to have followed gassing but the evidence does not seem to bear out this. Whatever be the initial cause the symptoms from which patients suffer namely shallow breathing and consequent inadequate ventilation of the lungs are due to want of oxygen yielding to oxygen treatment thus proving that their organism is functionally and not physically damaged.

The second group of poisonous gases was mustard vesicant which by a stand gas was the first noticed. Its action that it has no immediate irritant action on the eyes or respiratory passages but its vesicant action in low concentration and its lack of healing power are its most in the general family of gas that it is difficult to deceive man who subsequently suffered from it. Great thought was given to protecting personnel during the period in which it was employed. Experience showed that if one [illegible] it does not give rise to high casualties in troops well trained in gas defence.

The third group consisting of the new poisonous gases was supplied in the closing phase of the war in the hope that in the initial phases would be sufficient to put the troops opposed to them early in the fight they were not used primarily with the intention of killing but to cause casualties. Though they had some irritant effects on the eyes and lungs men who became actual casualties were [illegible] as a rule but fatality again very low.

The problems involved in this latter group are so [illegible] dealing with this alternative and will [illegible].

I will now return to the subject of anoxaemia which I have already stressed namely anoxaemia or oxygen want.

## Anoxaemia

Anoxaemia is the term applied to conditions where there is an interference with the oxygen supply to the tissues. It may arise from a variety of causes such as shortage of oxygen in the atmosphere or interference with the free gaseous interchange between the blood and the air in the lungs, as in the case of lung irritants, or diminution in the capacity of the

blood to transport oxygen in the normal quantity as in haemorrhage, or abnormal destruction of the red blood corpuscles, or to factors which alter the haemoglobin, whereby it is no longer capable of combining with the normal proportion of oxygen, as in carbon monoxide poisoning, or, finally, to any cause which may interfere with the free liberation of oxygen from the red corpuscles to the tissues

The grave effects of anoxaemia may have a serious effect on the circulatory organs, the nervous system or other organs of the body, these secondary effects not infrequently being a factor of considerable importance in the later history of cases The almost immediate loss of consciousness that occurs when we breathe an atmosphere devoid of oxygen, the mental failure, loss of muscular power and co ordination and the weakening of the heart's action—all these phenomena bring home to us the paramount influence on the cells of the body of a proper supply of oxygen

One can readily understand that if the oxygen supply to the body is interfered with by pulmonary œdema as found in lung irritants even during rest any attempt to perform muscular work may have disastrous consequences owing to the increase which is entailed in the oxygen consumption of the body under these circumstances

The gross changes in the lungs found in gas poisoning are responsible for serious interference with the gaseous exchange between blood and air The two clinical groups already mentioned, those with the livid cyanosis and those with the pallid collapse, have this feature in common, that the state of the blood indicates a grave deficiency of oxygen

What is the probable cause? Haldane puts it thus "When a portion of the lungs including even the greater part of both lungs, is entirely blocked by consolidation as in croupous pneumonia there is commonly no cyanosis This indicates that only very little blood is passing through the consolidated parts What passes through the healthy portion is amply sufficient for respiratory requirements during rest It must be borne in mind that the normal lungs and circulatory organs are adapted for meeting about ten times the respiratory requirements during rest, since the respiratory exchange is often about ten times as great during work as during rest Hence during rest in bed a very small proportion of normal lung will suffice for meeting respiratory and circulatory requirements provided there is but little circulation through parts which are useless But when cyanosis due to a lung affection exists, in spite of the fact that air is entering the whole or a great part of the lungs freely, we seem driven to the conclusion that the entry of oxygen into the blood through the alveolar wall is impeded by exudation and increase in thickness of the alveolar walls It is very important to realize that this may occur without any serious impediment to the passage of carbon dioxide outwards Carbon dioxide is about twenty-five times as soluble in water as oxygen, and hence it passes through the alveolar walls far more easily than does oxygen Moreover, a comparatively slight increase in the breathing will enormously increase the

small difference in diffusion pressure on which the passage of carbon dioxide depends but the same increase in breathing produces not only a slight proportional increase in the diffusion pressure which drives the oxygen inwards Hence we may have cyanosis, and consequently very formidable effects from oxygen want, without marked hyperpnœa The grey look of the patient's face will be a good index of this There will probably be no increase of venous blood pressure with its accompanying full blue cyanosis

Briefly then, two types of anoxæmia may be met with, the one where there is retention of carbon dioxide indicated by cyanosis, hyperpnœa and evident distress the other where there is no retention of carbon dioxide indicated by the grey appearance, pallid lips shallow breathing no distension of the veins and little respiratory distress This latter is more serious—why is this? In order to answer this question it is necessary to go into some fundamental facts relating to the physiological regulation of breathing

It was discovered by Haldane and Priestley that the lung ventilation is so governed through the action of the arterial blood on the respiratory centre that the percentage of carbon dioxide in the alveolar air remains nearly constant An increase of about 0 2 per cent in the alveolar carbon dioxide doubles the breathing during rest while a diminution of 0 2 per cent produces a temporary cessation Whether slow and deep or rapid and shallow the breathing will normally suffice to keep the alveolar carbon dioxide percentage steady

Fifty five years ago it was discovered by Hering and Breuer while experimenting on animals that when on inspiration the lungs expanded to a certain point expiration was initiated, similarly on collapse to a certain point inspiration began This so called Hering Breuer reflex is dependent on the vagus nerves but recently Haldane has shown that the governing centre for this reflex is excited by chemical stimuli A certain percentage of carbon dioxide in the blood is necessary to fire off this reflex and if too much carbon dioxide is washed out of the blood—as for instance in forced breathing—the subject goes into apnœa until sufficient carbon dioxide again accumulates What the respiratory centre really responds to when it reacts to increase of carbon dioxide is the balance of the hydrogen ion concentration in the blood The sensitiveness of the respiratory centre to changes in hydrogen ion concentration is so great that an apparently trifling alteration of hydrogen ion concentration in the blood may result in great changes in the breathing Though a definite percentage of carbon dioxide is normally necessary to fire off the respiratory reflex it has been proved that it responds to a lower percentage in the presence of lack of oxygen In other words, the threshold value as it is called at which the carbonic acid stimulates the respiratory centre is lowered in the presence of lack of oxygen

If the condition of oxygen lack develops the next response is periodic or Cheyne Stokes breathing Douglas and Haldane showed that by suitable means periodic breathing can be produced in perfectly healthy

[illegible]rsons, and that it occurs when the stimulus of slight anoxæmia cuts in to [illegible] the normal equilibrium of the respiratory centre by carbonic acid At [illegible]gh altitudes where there is diminished oxygen, periodic breathing is a [illegible] occurrence and may be accompanied by marked effects on the [illegible]ral nervous system as shown by the nausea headache and general [illegible] which constitute mountain sickness In the Royal Air Force [illegible] officers have found that such nervous disturbances are due simply [illegible] want at high altitudes and not necessarily if at all to the [illegible] dangers and strain of flying

[illegible] is one other point of great importance which must be con[illegible]d before the answer to the question as to why the grey type of [illegible]mia is more dangerous than the plum coloured type, namely, the [illegible]ship between the carbon dioxide in the blood and the readiness with [illegible] the hæmoglobin is able to impart its oxygen to the tissues or what [illegible] the oxygen dissociation curve of hæmoglobin It was discovered [illegible] and corroborated by Barcroft that the less carbon dioxide is present [illegible] blood the more strong is the affinity of hæmoglobin for oxygen [illegible] if there is less carbon dioxide than usual in the air of the lungs [illegible] hæmoglobin will take up oxygen more readily, the arterial blood will [illegible] less apt to be blue, and at the same time there will be less carbon [illegible] in the blood of the capillaries Hence the hæmoglobin will part [illegible] readily with its oxygen to the tissues The upshot of this is that [illegible]sis if it is present along with less carbon dioxide in the blood of the [illegible] is a great deal more serious than if much carbon dioxide is [illegible]ent

Now that we have a clearer understanding of anoxæmia its causes and [illegible] upon respiration and the respiratory properties of the blood let [illegible] few instances which occur in general practice in which [illegible] may be met with and the dangers resulting therefrom

It has been shown by Stadie and Meakins that there may be a con[illegible] lowering in the oxygen saturation of the arterial blood in cases of [illegible] Furthermore, they found that there was a direct relationship [illegible] lowering of arterial saturation and the degree of cyanosis [illegible] no doubt that the grave cardio vascular and nervous [illegible] which occur are in a great part the result of anoxæmia It [illegible] probable considering the character of the lesions and type of [illegible] lobar pneumonia that oxygen properly administered might [illegible] anoxæmia It must be recognized that this therapy is not specifically [illegible] but is absolutely indicated to relieve or remove the ill effects of a [illegible]gerous condition Therefore it is most important—perhaps *the* most [illegible]portant—factor in the treatment of pneumonia apart from the specific [illegible] of the infection that the patient should be prevented from developing [illegible] anoxæmia The early administration of oxygen to such cases is most [illegible]ptative as there is great danger of being too late when the signs of [illegible] vascular paralysis appear

The longer an anoxæmia lasts the more serious is the damage to the central nervous system and the longer does it take to recover from this damage, if recovery ever takes place. One can see this most clearly in cases of carbon monoxide poisoning with which health medical officers frequently meet, where the symptoms are due to anoxæmia and nothing else. It is well known, if a man has been unconscious for some hours in the poisonous atmosphere he is not likely to recover although practically all the carbon monoxide is out of his blood within two or three hours so that the anoxæmia is completely removed. In such cases and also in pneumonia where severe anoxæmia has continued for a long time we must not expect the patient to wake up as soon as oxygen is given and the anoxæmia relieved. Recovery of the central nervous system can only be a slow matter at best, and if during the anoxæmia period the cells of the central nervous system are sufficiently damaged recovery cannot take place in spite of adequate supply of oxygen. Of all the effects on the central nervous system the effect on the respiratory centre is the most serious. It is obvious that when the oxygen supply is inadequate products of activity arise which poison the vital mechanism of the various tissues and their normal response to stimulation ceases. The result is that the nervous centres tend to pass into a condition resembling narcosis.

With respect to the heart the effect of oxygen want will be gradually to destroy its efficiency, the tone and contracting force being depressed and the heart passes into a state of dilatation.

It will thus be seen that anoxæmia plays an important part not only in cases of gas poisoning but also in medical cases of all kinds in general practice, and is a subject which has not hitherto received the attention that is its due.

## Oxygen Treatment

As a comparatively short and sudden starvation of a sufficient supply of oxygen to the tissues is fraught with very disastrous results, it is important that where anoxæmia develops it should be speedily relieved in order to allow the natural recuperative processes to exert their full effects. We cannot of course rectify the damage that has been done in the lungs but we can take steps to combat the anoxæmia.

The administration of oxygen is a powerful remedy for this interference with the oxygen supply to the tissues.

The main indication for the administration of oxygen is shown by the colour of the lips and face. If the capillaries are distended with blood the colour is full blue or plum colour; if the capillaries are not distended the colour is leaden or grey. In both cases there is anoxæmia. It must of course be clearly understood that in anoxæmia the patient must be prevented from undertaking any muscular exertion for if the supply of oxygen to the tissues is inadequate when the patient is at rest (when his oxygen requirements are minimal) any wilful increase in the oxygen consumption of the tissues can only spell disaster. Let me remind

in that it one stands up one's oxygen consumption is considerably less the figure obtained when one is lying down, whilst walking at only two miles per hour will raise the oxygen consumption to between twice and thrice its lying value

Bearing these facts in mind it will be useful to refer here to the special methods of administrating oxygen In the first place it is necessary to have clear ideas as to the objects aimed at If the oxygen is only given to enable the patient to surmount some quite temporary crisis due to anoxæmia a very simple method of administration will suffice namely a small cylinder of oxygen furnished with an india rubber tube by means of which a stream of oxygen is directed into the patient's open mouth Such an arrangement will probably often be useful in certain cases, as the oxygen could be given promptly by a competent nurse at any time In the great majority of cases however the cause of anoxiemia is one which may last for a considerable time so that the administration must be continuous Oxygen is still often given by methods which are either quite ineffectual or extremely wasteful One method is to place a funnel over the patient's face and allow some quite indefinite amount of oxygen to pass into the funnel By this method the patient re breathes a good deal of expired air, but may hardly get any of the oxygen, as being heavy it sinks out below

Despairing of any aid from the addition of oxygen to the inspired air by the usual method of administration fruitless methods have been made to introduce oxygen into the body by other routes—under the skin by the rectum or even by intravenous saline infusion enriched with oxygen Very few none of these means could supply the quantity required

A good method is to insert a rubber catheter or other soft tube into the patient's mouth or nose and pass a stream of oxygen through the tube Another method when pure oxygen has to be given is to allow the oxygen to pass at a sufficient rate into a rubber bag connected with the inspiratory valve of an anæsthetic mask placed over the patient's mouth and nose The patient inhales from the bag and exhales to the outside through the expiratory valve in the mask

It became evident during the war that an efficient apparatus for the continuous administration of oxygen with maximum economy was greatly needed particularly in the treatment of acute gas cases Haldane therefore devised an apparatus so arranged that by a simple device the patient inspired through a face-piece the whole of the added oxygen without waste during expiration while the proportion of oxygen could easily be cut down or increased according as was needful The enormous consumption of oxygen had previously made it almost impossible to get enough cylinders for the treatment of a large group of cases at the place and moment where they might suddenly be needed Haldane's apparatus allowed a continuous administration to be carried out over the two or three days during which there was a danger from anoxæmia Patients could sleep com

fortably during the administration The apparatus was later simplified with the special object of making it both easy for a nurse to handle, and available for the front line and stretcher work The amount given should be the minimum required to keep the colour normal which is likely to be anything from one to three litres per minute In any case it is not desirable to administer anything like pure oxygen for a very long time because pure oxygen has itself a slow irritant action on the lungs so that it is not desirable for a patient whose lungs are already damaged to breathe it too long The proper course to pursue must be determined by the physician after careful observation of the patient, and in the light of his experience and knowledge The almost immediate effect of oxygen is that the colour of the face becomes normal, the pulse becomes stronger and less frequent, and the patient's general condition improves The remoter effects are that the various secondary injuries caused by anoxemia on the central nervous system and other organs are prevented The effects of continual oxygen inhalation on the arterial blood in pneumonia and bronchitis have recently been investigated by Meakins He found that with two litres a minute the percentage saturation of the hæmoglobin in a pneumonia case with almost complete consolidation of one lung rose from 82 per cent to 91 per cent, but went back on stopping the oxygen to 84 per cent slight cyanosis returning also On then giving three litres a minute, the saturation rose to 97 per cent., which is two per cent above the normal value for healthy persons In a bronchitis case with slight cyanosis and orthopnœa, the saturation rose from 88 6 per cent to 97 0 per cent on giving two litres a minute, and the symptoms disappeared

Another method for the continuous administration of oxygen especially for pneumonia cases is that designed by Professor Leonard Hill The main feature of his apparatus is that the patient is enclosed in a small chamber made of fabric to which oxygen is admitted at a given rate, and from which the carbon dioxide is removed by soda lime This device can be folded into such a small compass and is so light that the doctor can easily carry the whole equipment including the oxygen cylinder, in his motor car—if he has one

In addition to its use in the intense anoxemia of acute gas poisoning during the war, oxygen was also tried at a much later stage in the treatment of chronic gas casualties These were men who suffered from shortness of breath associated with tachycardia and rapid breathing, and the evidence showed that a persistent shortness of oxygen did occasionally appear in these cases whether this shortage was caused by damage to the lung epithelium or by a type of shallow breathing, with imperfect ventilation of the lungs oxygen treatment caused general improvement in the patient's condition and ability for physical effort and favourable results were obtained

Finally before leaving this subject I should like to emphasize the im-

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[illegible] importance of the early [illegible] and the necessity of the immediate relief [illegible] oxygen.

[illegible]

When considering the [illegible] of an [illegible] was confined to the primary cause of the shortage of oxygen which, in the case of poisoning by acute lung irritants and allied conditions is to be found in the hindrance imposed on the passage of oxygen from the alveolar air into the blood We must now take into account the secondary cause dependent on circulatory failure in one or other form, and be prepared to adopt suitable treatment to counteract its effects Clinical evidence during the war was in favour of venesection but not as a routine treatment in all cases Of the value of venesection in the cases showing venous engorgement there can be no doubt and the rapidity with which the abstraction of blood is followed by an amelioration of the patient's condition such as diminution of the cyanosis and distinct reduction of the dyspnœa, headache, &c, suggests that the treatment mainly owes its effects to an immediate relief of an embarrassed circulation at a critical period when the heart is beginning to fail, and its right side to dilate under the strain

The bleeding should be carried out slowly, and from 18 to 20 minutes should elapse during the bleeding the quantity removed amounting to about 20 ounces

Venesection of the grey, ashen cases that showed no venous engorgement, was found to be not only useless but harmful

In animal experiments it was found that when bleeding was combined with the intravenous infusion of isotonic solutions still better results were obtained, as it was thought that infusion would help to check the increase in viscosity which is present

The French were convinced of the value of free venesection The Germans also urged its value, and tried infusion in a few cases with beneficial results, but the latter treatment was not recommended enthusiastically They laid more stress on venesection than on infusion as a means of reducing the abnormal concentration and viscosity of the blood

The British employed saline infusion with grave doubts as to its efficacy to diminish the concentration of the blood, in other words to restore the fluid that has been lost largely in the production of pulmonary œdema The reason for this uncertainty and caution was because any benefit therefrom was purely transitory, and it was feared that the pulmonary œdema might be increased, as it was known experimentally that considerable injections of saline tend to leak out again very quickly from the circulation and to produce pulmonary œdema even in the normal animal, and unless any leakage from the lung capillaries could be stopped, intravenous injections of saline might do more harm than good

What is the reason for this? And are there any known means by which it can be overcome?

[illegible] these points it is necessary to [illegible] briefly the difficult question of osmotic pressure and a few general properties of colloidal solutions. The recent work by Professor Bayliss has helped to throw considerable light on this subject.

With regard to the explanation of the way in which osmotic pressure is produced even experts are not agreed. We must therefore be content with a brief consideration of the facts.

Suppose that we have a bag of a material such as parchment, paper, or collodion which is pervious to water but whose pores although large enough to allow salts and sugar to pass through are too small for the large particles of colloids, such as the proteins of the blood. If this sac be filled with blood and immersed in water the salts soon pass through and become practically equal on both sides, but the colloids remain inside. This difference between the inside and outside causes in some way the attraction of water to the interior. The force of this attraction is proportional to the concentration of the colloids. This is known as the osmotic pressure of the blood colloids. It is this property which prevents the rapid loss of fluid from the blood by filtration through the capillary walls and controls the production of urine. This property of osmotic pressure is perhaps the clearest case that can be produced in support of the physiological importance of the colloidal state of substances in solution. If we exert pressure on the contents of the sac so as to try to force the water out of the sac by filtration none will escape until the pressure applied exceeds the opposing osmotic pressure of the contents of the sac. The walls of the blood-vessels have properties like those of parchment paper and normally do not allow passage to colloids. Hence the conditions are present for these colloids to exert their osmotic properties of attracting water with a certain force. But in the arteries and in the first part of the capillaries the blood pressure is higher than this. There is accordingly filtration of fluid, *i.e.* lymph. As we proceed towards the veins the blood-pressure diminishes and reaches a value below that of the osmotic pressure of the blood colloids. Reabsorption begins here and most of the previous filtrate is taken back again. What remains is carried to the thoracic duct by the lymphatic vessels. We have seen that the value of the osmotic force is proportional to the concentration of the colloids of the blood. Hence, if we dilute the blood by the addition of a solution which contains no colloids, such as saline, we reduce the force opposing filtration and the blood has also to travel further along the capillaries before the pressure is reduced sufficiently to allow reabsorption. Both causes combine to produce an excessive filtration which will continue until the blood returns to its normal osmotic pressure—that is until the liquid injection has disappeared. The obvious conclusion is that some colloid with an osmotic pressure equal to that of the blood must be added to the injection solution. Bayliss has found that gum arabic or acacia answers all requirements. It is quite innocuous, and in a concentration of 6·5 to 7 per cent. in 0·9 per cent. sodium chloride

has an osmotic pressure equal to that of the colloids of the blood. It viscosity is also practically identical with that of the blood. The salt necessary to make the solution injected isotonic with the blood plasma was also found suitable but is liable to contain tetanus spores.

In the past the quantities used have been frequently too small, and since properly prepared gum saline is innocuous, large quantities can be given with safety.

Gum saline may be utilized in many conditions that occur in general practice such as accidents with or without haemorrhage involving injury with a resultant toxaemia similar to that of wound shock in war, shocks from surgical operations, haemorrhage from gastric ulcers or *post partum*, though in such cases it will be clear that no permanent good can result until the source of haemorrhage has been stopped. A great loss of fluid from the intestine, and the consequent concentration of the blood as in cholera, suggests that the injection of gum saline is required. Recovery has been brought about in hopeless cases of blackwater fever by intravenous gum saline due to the raising of the blood pressure and the stimulation of urinary secretion.

There are probably many conditions where infusion of gum saline will reduce the viscosity of the blood, making the circulation more rapid, and the increased velocity more than compensates for the loss of oxygen-carrying power since the number of corpuscles passing a particular cell in a minute is greatly increased, and the supply of oxygen thereby becomes sufficient.

## Chemical Warfare as Applied to Industrial Hygiene

It may now be of interest to refer briefly to the benefits which have accrued to industrial problems following on researches carried out under the aegis of chemical warfare. Time does not permit of a comprehensive statement covering all spheres of application so I will refer only to a few typical examples where advancement has been made as a direct result of these researches. It is unnecessary to labour a fact which is universally recognized, namely the extraordinary stimulus which has been given as a result of warfare problems to the world of chemical activity, with its application of modern methods to all branches of industry wherein chemistry plays a paramount part either in its direct application, or in economically justified indirect utilization of by products. *En passant*, the Americans state that in their industries approximately 500 million dollars have been saved annually as a result of scientific research work.

Let us now review a few of these applications —

Many wartime gases have been employed in the fumigation of ships, but those holding out any prospects of future general use are prussic acid and cyanogen chloride. These two are equally efficient as fumigants but the advantage of cyanogen chloride over prussic acid lies in the fact that it has lachrymatory properties and therefore easily detected, whereas prussic

acid not having this property is in consequence dangerous because of its undetectability. It is suggested that where prussic acid is used, this inherent defect could be overcome by mixing with it a gas having lachrymatory properties.

Again, especially in tropical countries, the damage caused to crops, plantations, &c., and the inconvenience caused to the inhabitants of houses, &c., by insect life has been a problem of which a solution has never been adequately found. The application of gases finds here a possible remedy which is now interesting the attention of those engaged in preventive measures. This include plague-carrying rats, ground squirrels, rabbits, cotton boll weevils, locusts, grasshoppers, ants, various types of harmful insects, the potato bug, the body louse, the insect pest of sugar beet, the barbary plant, which is the carrier of wheat rust, &c. Many gases and solids have been tried, but the best results have been obtained with chloropicrin. There is no doubt as to its efficiency as an insecticide and it has the advantage of lachrymatory properties. It is therefore easily detected, but it is a very poisonous compound, the greatest care must be exercised in its use.

As you are all aware the problem of protection against carbon monoxide poisoning was one which was ever present in many operations during the war, especially where tunnelling operations were in progress, and its possibility of occurrence in gunpits on land and in turrets at sea. Though the war is over, the problem of carbon monoxide is one which ever recurs in so many spheres of industrial activity. Since the *modus operandi* of carbon monoxide poisoning is quite different from that of other gases, it was obvious that gas masks, though affording protection against other gases, were useless against the former. It was therefore incumbent that a protection involving new principles should be investigated as the method of protection used before the war, namely, self contained breathing oxygen sets, was cumbersome and not always suitable for all possible contingencies. A promising field has been opened up which may afford protection to large numbers of individuals, and at the same time being simple in construction, will overcome the intrinsic drawback of oxygen sets which require skill in their use. The essential nature of this protection is based on the chemical fact that under conditions carbon monoxide can be rendered innocuous by its conversion in the presence of certain oxidizing agents into carbon dioxide. These oxidizing agents, of which there are many, have been incorporated in a container which can be attached to any face piece. Further research on this vital problem is required to determine the best oxidizing agents, their relative quantities which will give the maximum speed of reaction, and in consequence the most complete protection. Certain of these protective substances have already appeared on the market but they have not yet attained the desired degree of efficiency.

The final problem which I should have liked to have dealt with in detail is that of the application of gas masks to industrial and other conditions,

covering as it does such spheres of activities as occur in dangerous trades where noxious vapours are present, the ever-present necessity for protection for those engaged in fighting fires, and I may add incidentally their utility under circumstances which seem to increase almost daily such as this present afternoon whereby a long suffering audience can seek protection from the vapours of verbose orators

Much has been talked and written about the necessity for an ideal gas-mask which will afford protection under all possible conditions It will be fairly obvious that such a gas-mask if evolved would not only be expensive but frequently unnecessary A small amount of money expended on research by various trades concerned would soon solve the problem as to the type size and line of protection required which would be most suitable for the various conditions inherent thereto It is unnecessary for me to detail the various types which would be used but I will ask you to bear in mind the three essential points which hold good in the design of all types of gas masks, namely first it must afford complete protection against the noxious agent to be encountered secondly, it must not by its resistance, size or other properties interfere with the efficiency of the worker and thirdly, it must be simple in construction foolproof, and incorporate nothing which is unessential

Mr President ladies, and gentlemen I have tried to put before you in this short lecture a few facts which I hope may have interested you in problems in which though born while the world was suffering amid the throes of destruction will continue in their future development to stretch forth a helping hand to suffering humanity Chemical warfare will still continue to furnish an important link in the chain of chemical industries, and contribute to peace time welfare of the community at large. There are still—even in this age of scientific thought—many who fondly imagine and delude themselves into believing that the era of eternal peace will dawn with the advent of disarmament conferences, and speeches of tranquillity but chemical warfare is a product of civilization and an outcrop of science, and the wheels of science revolve slowly in spite of the efforts of cynics to stop them I will only remind you in conclusion that nearly every great advancement of science has been opposed—chloroform, vaccination the law of evolution, and modern scientific methods In days of yore Solomon de Caus was locked up in a mad-house for proclaiming that ships and vehicles would be moved by steam Simpson, who first made use of chloroform in obstetrics was considered an agent of the devil, and so was Jenner the introducer of vaccination against small-pox George Stephenson was virtually outlawed His invention, the locomotive, was declared to be contrary to the laws of God, because it would prevent cows grazing hens laying, and would cause ladies to give premature birth to children at the sight of these things going forward at the rate of four and a half miles an hour!

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## A MALTESE HOLIDAY

By Commander L. T. Cope, O.B.E., R.N.

[illegible] the festas or holidays in Malta—that [illegible] of [illegible] the feast of Luminaria which takes place at Notabile (Città Vecchia) the capital annually on June 29, the feast of SS. Peter and Paul.

The name Luminaria is a corruption of Luminaria (illumination) and is so called from the illumination of the cathedral church of the city on the eve of the festival.

Città Vecchia (= the ancient city) used to be called Mdina (= town) when the islands were under the domination of the Moors, and the name was changed to Notabile on June 29, 1478, in commemoration of a 'notable' event in the history of the island, when, by an act of King Alfonso, it was decreed that 'the islands of Malta should henceforward never be separated from the Kingdom of Sicily, and that its inhabitants should enjoy the same privileges as those of the inhabitants of Palermo, Messina and Catania.'

The town itself, called Rabato ('capital') by the Maltese, a typical mediæval town, was occupied during the Napoleonic wars by the French, under Général Vaubois, from June, 1798, to September, 1799, when the small garrison of 65 men was overpowered and killed by the populace, who had been exasperated by the high-handedness and licence of the French, an attempt by whom to sell the property of the Carmelite Church in the town brought matters to a head.

The National Horse Races, the great attraction of the day, which take place at 6 o'clock in the afternoon, are preceded by an agricultural show, some three miles away, in Boschetto Gardens adjoining Verdala Palace, the Governor's summer residence, which was built by Grand Master Hugh de Verdala between the years 1583 and 1590 for use as a summer palace by the Grand Masters.

This agricultural show was instituted in 1897 by Sir William Reid, Governor of Malta, and always produces fine exhibits of fruits, grains, cereals and live stock grown in the island.

After an early morning service in the cathedral, at which the bishop officiates, the peasants attired in their holiday best, the women wearing their ornaments of heavy gold Maltese jewellery, drive to the show in the local country carts, light flat vehicles on two wheels. So universal is the custom, on the part of woman of the peasant class of attending this festa, that, till recently, young women residing in the country used to insist, when about to be married, that it should be particularly stipulated in the marriage contract that their husbands "should take them to Boschetto on the feast of SS. Peter and Paul."

The scene in the gardens is most animated. In all directions one sees, under the leafy orange trees, happy family parties who, after making

[illegible] indulging in [illegible] —including large dark [illegible] of which can [illegible] pavement of [illegible] the excessive [illegible] as the air [illegible] evening Above [illegible] general adjournment to the [illegible] —a stretch [illegible] directly underneath the city walls—[illegible] mile in length [illegible] houses and mews and three quarters [illegible] also uphill [illegible] The road which is about 20 ft wide with built up stone wall [illegible] side is half filled with spectators [illegible] brick with [illegible] police, while on the walls in the blazing sunshine sit [illegible] country women cheerfully occupying [illegible] hours in order to get a good view The country carts [illegible] a big field [illegible] the owner of which [illegible] good harvest by charging one penny a wheel for all vehicles left there

The winning post is marked by a painted line on the wall opposite the Grand Stand an open stone work balcony built for this purpose in 1890 This racecourse is therefore considerably older than our Derby which dates from 1780 but cannot compare in age with the other well-known Maltese meeting —the St Rocco races—instituted in 1593 as a thanksgiving for the cessation of an epidemic of plague that had raged for 12 months and which are still held annually on the road by the [illegible] of Floriana on August 16 the feast of St Rocco an obscure saint also supposed to have worked miraculous cures of plague at Piacenza in Italy All the other horse races in Malta and Gozo owe their origin to these St Rocco races

From the stone balcony mentioned above in bygone days the Grand Master judged, and presented the prizes This is now done by the Governor The prizes consist of lengths of handsome silk brocade and lama cloth of gold the winning owner presenting his banner to the church of his village, where it is used as an altar cloth

The Governor having arrived and taken up his position, to the strains of the National Anthem the races are started by firing a small mortar not at the starting post—a pair of small stone towers on the walls by the road —but on the slope of a hill above the winning post Two mortars are fired, one a preparative, and the other about three minutes later The starter then gets busy, and shortly after the race begins The jockeys (professionals) ride bare-back, and have no bridle (possibly to prevent pulling!) but carry two whips with which they steer and belabour their mounts spirited little barbs from North Africa. All the way up the course the crowds encourage their fancies, not only by shouting and waving their arms, but even by hitting the horse that carries their money, and impeding his competitors! Enormous sums of money change hands and many a peasant goes home having lost a year's savings on a single race

Immediately the horses have passed the winning post the jockeys jump off and run back to the start to be ready to ride in the next race—a strenuous form of exercise on a warm summer evening in Malta.

As soon as the last race is over the crowd disperses running in all directions or driving home lying on their flat country cars to spread the news to the outlying villages where later the winning horses are covered with garlands of flowers and ribbons are led in triumph through the streets and receive a welcome worthy of the homecoming of heroes.

The drive back to Valletta in the cool of the evening along the white road bordered in places with oleanders in bloom and lined by crowds of country people, all out for enjoyment, who can appreciate the fine points of a horse, and are not averse to showing their preference by cheering a smart turn-out, brings a very pleasant outing to an end, while in many a little homestead the story is told again of how the horse of Andrea of Cutini, or the mare of Giuseppe of Casal Lia, won the great race, and brought honour to the village, an honour that will be remembered every time the altar cloth is seen in the village church.

# Naval Medical History of the War.

## [illegible] OF TROPICAL AND SUB-TROPICAL MEDICINE
*(continued)*

### MALARIA IN THE EASTERN MEDITERRANEAN WITH SPECIAL REFERENCE TO ITS PREVENTION UNDER THE CONDITIONS OF ACTIVE SERVICE

By Surgeon Commander LESLIE M MORRIS O B E R N

*(Continued from p 144)*

Having established an active anti mosquito campaign and dealt with all breeding places as far as possible it only remains to adopt personal precautions and to establish regulations in the camp for the prevention of malaria

In order to have any success in this direction it is first necessary to [illegible] lectures to all concerned and to create an intelligent interest in the [illegible] and value of these measures The personnel includes in war time a large percentage of men who previously have never been out of England and have no idea of self preservation in localities infested by mosquitoes and flies

Lectures if given in the manner to create an interest, may be of great value in the prevention of disease

If the camp is a permanent one then mosquito proof huts may possibly be provided These huts are best raised one to two feet from the ground and fitted with wire gauze windows and doors The wire gauze should be eighteen mesh to the linear inch

Mosquito nets of the bell shaped pattern are the most serviceable To make a net it requires four yards of netting 7 ft. 6 in wide

The most easily arranged pattern is to have a spreader at the head and foot suspended from an upright support at each end of the bed This avoids the necessity of cutting the netting and permits of ample room to tuck the net under the bedding

Sentries on night duty are supplied with cap veils arranged over a circular wire spreader and tucked into the tunic Canvas gauntlet gloves are used to protect the hands and wrists

All men should when possible be in mosquito-proofed huts after sunset No 'shirts' should be allowed after sunset, and tunics should be worn to protect the arms Leave to local villages should be stopped

Any tents or huts where mosquitoes are discovered can be sprayed with 1 2 per cent solution of formalin

Dug-outs are favourite places for mosquitoes to rest in and should be periodically sprayed out with formalin

Should night exposure become necessary, then an anti mosquito preparation is supplied and kept handy

The most efficacious form found was Price's, which consists of a solid preparation made in the mould of a Price's night light This is rubbed on the exposed parts and was very popular and efficient

Ointments are messy in use in hot climates

Pyrethrum fumigation cones are useful in tents if mosquitoes are present, especially in hospital tents

A length of mosquito netting suspended over the opening of a bell tent was used when necessary

Latrines were made mosquito proof and the guard not on sentry go, were accommodated in mosquito proof huts made from aeroplane packing cases.

These precautions give satisfactory results as long as they can be carried out, but in the course of active service, with its many alarms and excursions, there come nights when the whole personnel is actively employed in the open or taking cover in dug-outs During these occasions an efficient anti-mosquito prophylaxis is the only safeguard against infection

Ships when engaged near a malarial locality and anchoring in the proximity of shore swamps, have a very potent method of prevention of infection if they have a choice of anchorage If the prevailing night wind is off shore the ships need to allow for this when anchoring, but if the prevailing wind is from the sea then they can approach closer in with immunity

A monitor, at Thasos anchored half a mile from a particularly bad area of swamp, but had no infection as the night wind was invariably a sea breeze from the north east A motor lighter tied up to the pier had every man infected

The invariable rule is "The nearer to the beach the greater chance of infection

The crews of ships should return on board before sunset

Other precautions to be taken, when dealing with men unaccustomed to hot climates, are to ensure the wearing of helmets between 9 a.m and 4 p.m , and also to prohibit sea-bathing during these hours

If possible active work in the open should be curtailed during the heat of the day, as over-fatigue combined with the heat of the sun predisposes to a severe attack if malaria is contracted

The value of quinine, as a prophylactic, has been much discussed In order to gain efficiency it is necessary to personally supervise its administration and method of dosage

Where mosquito prophylaxis is incomplete it becomes necessary to rely on quinine to some degree, in order to minimize infection, if not to prevent it Pellets of compressed powder have been proved to have failed,

and are quite unreliable on account of their doubtful solubility and absorption

The only reliable method of giving quinine in prophylaxis is in acid solution taken on an empty stomach and under supervision

After trying various doses and at various intervals I have come to the conclusion that the most rational and efficient method is to administer the quinine in curative doses at intervals of five days

The method used in 1918 which gave the best results was as follows —

Fifteen grains in solution after breakfast, followed by a second dose of five grains after tea on every fifth day, commencing in July and continuing until early in October

No bad results followed these doses

At Thasos and Stavros where this method was used there were no cases of infection during the period of administration At other places quinine was not given in view of the fact that successful anti-mosquito prophylaxis had been accomplished by drainage and other methods

Smaller doses of quinine given at more frequent intervals did not prove much value except in modifying the initial onset and preventing the graver signs such as hyperpyrexia cerebral signs and severe vomiting

No cases of blackwater fever occurred

The quinine salt used was the basic sulphate obtained from Admiralty contractors The object aimed at was to effect a curative periodical saturation with quinine, at regular intervals and to permit the digestive system sufficient to react between times so as to avoid a cumulative effect It was hoped that 30 grs of quinine every fifth day would prevent the development of the parasite and so become a means of aborting an attack of malaria

The results obtained were successful when dealing with a limited number of men under careful supervision

The mosquitoes of this area are *A maculipennis* and to a lesser degree *A bifurcatus*

The active hatching out season is from June to the end of August Malaria commences in June and increases to its maximum intensity about the middle of September After the first half of October the nights become colder and infection rapidly dies down

The type of fever is mostly benign tertian with many cases of double infection

Macedonian malaria has proved to be somewhat resistant to quinine treatment but perhaps the strain of war in Macedonia had lowered the vitality of the infected men and altered their natural powers of reaction

The cases as seen at Thasos in 1917 were mostly of a particularly mild type and were of short duration Quinine had been regularly taken in doses of 10 grs and 5 grs on alternate evenings

The initial onset was not severe, nor were any acute manifestations seen The cases were removed as soon as possible by motor lighter to a

temporary hospital on the south coast of the Island, where they had the benefit of complete change in a locality free from anophelines

The treatment given was as follows —

In the pyrexial stage, after a dose of calomel and sulphate of magnesia quinine was given in solution in doses of 15 gr twice or three times a day, for a period of about five days

If indicated by vomiting or severe type of fever, quinine was given by intramuscular injection in doses of 1 grm of the bihydrochloride in 2 c c of sterile water, from ampoules These injections are repeated every evening or more often if necessary, until the pyrexia falls and the vomiting ceases

Acute cerebral types of malaria are treated by the intravenous method, using 10 gr of the bihydrochloride in 10 c c of prepared saline fluid

Intramuscular injections form a valuable control in treatment of severe cases, but should not be given if the patient is extremely anæmic or emaciated The buttock is the most convenient and safest site for the injections and I have never yet met with any unfavourable results

Following the pyrexial stage, which is usually short there comes a period of treatment in which change of locality and a generous diet take an important part Quinine in this stage is given, always in solution, for a period of about three weeks in doses 10 gr t d s. allowing a rest for two days in each week If anæmia is present or there is loss of weight, then the addition of arsenic is indicated, especially if the case appears to resist quinine and tends to relapse

Arsenic can be conveniently given in pills of the di sodii-methylarsenate, 1 gr t d s (arrhenal) or by Fowler's solution using increasing doses

The next period of treatment lasts three months and consists of quinine and arsenic given alternately, at the same time attempting to prevent any tendency to debility by giving phosphate of iron and by the addition of stout, if procurable Quinine is given on two consecutive days in each week in doses of 15 gr twice a day preceded by two days treatment with arsenic, combined with other tonics, if necessary

The future treatment consists in measures taken in order to prevent relapses such as the avoidance of extremes of temperature and of over-fatigue It is necessary to avoid sea bathing after an attack of malaria and to wear suitable underclothing to maintain the body temperature when changing from one climate to another

The treatment of any case of malaria is a prolonged course of quinine combined with arsenic, given actively for a few days in each week and not continually

In dealing with the important question of the prevention of malaria in war time it is continually brought home that the only way to obtain success is by an energetic anti larval prophylaxis

This will give far reaching results and by its aid any certain malarial locality can be transformed by burning clearing and drainage, into a dis-

tract which [illegible] swamps can be reclaimed for cultivation and so rid the [illegible] disease which in these localities is so obviously causing [illegible]

As far as malaria was concerned, it caused considerable sickness and loss of efficiency in the various military operations conducted in this [illegible] and little known sphere of action

The results obtained from the work at various islands conducted with local labour were most gratifying and gave promise of complete success if time permitted

At Thasos where malaria is particularly severe along the north coast of the island it was possible to drain and clear an area of two miles from the camp, but, owing to extensive swamps, complete work could not be attempted

The sick rate was, however markedly decreased at each succeeding year of work, and large areas reclaimed for cultivation

At Kassandra it was possible by local drainage to completely free this locality from malarial infection in two years of work At Imbros Mitylene, Stavros and Syra the results of anti larval work proved of great value in maintaining the efficiency of these aerodromes

Malaria only exists in certain localized spots and could be readily eradicated if the knowledge of the value of this work was available and scientific drainage undertaken

Educational and engineering methods are necessary to develop the health and subsequent prosperity of these islands which at present exist under somewhat primitive conditions

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## (iii) ANTI-MALARIAL WORK AT KASSANDRA 1916 to 1918

By Surgeon Commander J H B MARTIN M.B. R.N

In the middle of April 1916 an airship station was opened some two miles north east of Kassandra Point, on the eastern side of the entrance to the Gulf of Salonica About forty men were landed in charge of a couple of officers of the Royal Naval Air Service with instructions to erect an airship shed for the "S S" type of ship with the utmost despatch Military considerations were of paramount importance and the work was undertaken in spite of the knowledge that the site selected was a well-known marsh, and that the lower part of the valley was practically under water in the rainy season

The conditions which prevailed during the first few months of the station's existence necessarily exposed all ranks and ratings to repeated nightly infection with malarial fever The work was carried on day and night the first tents were pitched close to the shed itself on the edge of the marsh the shed was illuminated all night long, thereby attracting all the mosquitoes in the valley to the spot, there was no mosquito netting

and [illegible] in the camp and the only [illegible] precautions that could be [illegible] at that time were the minimum requirements for living [illegible] and for ensuring the stability of the airship shed.

Hospital [illegible] of all ranks and ratings were [illegible] with malaria during the following three months. As many as [illegible] cases of malaria were sent to hospital at Salonika on one day [illegible] in August 1916, out of a maximum strength of 112; and on one occasion there were only eight able-bodied men on the station to take out the airship to fly her, and to land her again on her return from patrol.

The camp was gradually moved up the nearest hill, the few drainage trenches were deepened and extended as circumstances permitted, and oil and paraffin were used liberally when the supply arrived towards the end of the summer. In September, 1916, the medical officer was invalided home with septicæmia, contracted whilst operating on a case of empyema, and a temporary surgeon replaced him till I took over medical charge on March 21, 1917.

Fig. 1.—View of a part of the valley at [illegible] from a point [illegible] R.N.A.S. camp.

The scene of operations was a fertile valley, some two miles long, by one mile broad, which separated the vicinity of Kassandra Point from the rest of the Kassandra Peninsula, its long axis running, in direction, N.N.W. and S.S.E. The bend of the valley was 200 ft. or more above the level of the sea, and faced in the direction of Sapiens Island, while its mouth opened out on to the Gulf of Salonika with Mount Olympus in full view on the opposite coast.

The most conspicuous feature in the lower part of the valley (apart from the airship shed) was a tract of marsh land, at least half a square mile in extent, with a fresh water lagoon, some 100 yds. long by 25 yds. wide, just below it, separated from the sea only by some 40 to 50 yds. of shingly beach.

The camp was situated on the south-west side of the mouth of the valley, on the slopes of a hill 180 ft. high, immediately overlooking the marsh and the airship shed. The full complement of the station during

1917 was eighty R N and R N A S ranks and ratings a total of forty at the French Seaplane Station, and a Greek working party of forty also The Greek camp was pitched near the airship shed on the edge of the valley the French camp was placed a little above this and the R N A S. camp proper ran up to within 30 ft of the top of the hill

During 1916, the whole of the camp was under canvas In February, 1917, mess huts were erected and used for meals and recreation but the men continued to sleep under canvas Finally, by the summer of 1918 arrangements had been made for all the men to sleep in mosquito proof wooden huts As a result of these and other measures, the incidence of

FIG. [illegible] fro[illegible] Age of [illegible] for ground [illegible] the airship shed [illegible]

fresh infections [illegible] fever was reduced from 90 per cent in 1916 to 7 7 per cent in 1917 [illegible] in 1918

The anti-malarial precautions adopted followed the two well known principles of the extermination of the mosquito, and the effective protection of the personnel against mosquito bite

General measures against the mosquito included drainage of the marsh, destruction by cutting and burning of all reeds canes, long grass, scrub and low bushes in the vicinity systematic oiling of all fresh water pools and streams (excepting only our drinking water supply 1 500 yds from the camp) the covering over of all open wells with suitable wooden boarding the gradual removal of the camp farther up the hill, and the removal of

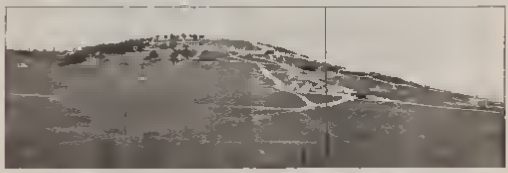
[illegible] the other side of the hill from [illegible]

[illegible] into bite was safeguarded by the [illegible] precautions —

(1) The [illegible] Hays latrines sick bay and W. I. huts were [illegible] possible. During 1917 each tent was [illegible] mosquito net over the entrance and vent[illegible]

(2) Latr[illegible] in the camp including the Greek working party was provided with an efficient mosquito proof bed net capable of being tucked [illegible] measuring [illegible] ft long by 3 ft wide and 3 ft deep.

(3) Quinine [illegible] was given every day immediately before the [illegible] Meal Supper but [illegible] were given for [illegible] and [illegible] were given on



[illegible]

[illegible] Shirt[illegible] trousers [illegible]

(8) After sm[illegible] mosquito p[illegible]

(9) Mosquito [illegible] employed in the [illegible] employed the men in the [illegible] discontinued. Pressure [illegible] engines be tested with [illegible]

(7) Special [illegible] value at all.

The type of malaria en[illegible] practically [illegible]

[illegible] Indian each two miles distant from the camp were infected [illegible] malaria insidious in its onset but relapses are common and [illegible] only to be expected if the case is diagnosed early and [illegible] from the onset of the first symptoms

[illegible] which year I have fairly complete records there were [illegible] malaria of which only six cases were primary infections [illegible] all well-defined mild in character and of short [illegible] at most They yielded readily to treatment with [illegible] twice a day for four days followed by 10 gr once or [illegible] weeks afterwards Two cases however who had [illegible] treatment during the primary attack the previous [illegible] and seven relapses respectively during the months [illegible] September I came across a single case of malaria [illegible] of temperature even in double infections The [illegible] chiefly by the fact that the onset of my [illegible] the day that it would have been expected in the case [illegible] but recurred on the 3rd day and frequently [illegible] day from the initial time table of the previous [illegible] double infections calculated in this manner in [illegible]

[illegible] attack occurred between 12 noon and 4 p m in [illegible] and between 8 30 a m and 11 a m in 23 per [illegible] occurred in equal numbers between 6 p m and [illegible] midnight and 1 8 a m The monthly incidence [illegible]

| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| [illegible] | [illegible] | [illegible] | [illegible] | 3 | 6 | [illegible] | 7 | 5 | 2 | 3 | [illegible] |

[illegible] only [illegible] infections during 1917 Five of these [illegible] in the end of July and the beginning of [illegible] the middle of November Two of [illegible] after their arrival on the station [illegible] of increased susceptibility to the [illegible] Malarial parasites were scarce in the peripheral [illegible] In high temperatures recorded [illegible] complications [illegible] labile [illegible] Two of the cases were probably infected while [illegible] near the airship shed and two others while on night [illegible] The best treatment for the recent infections seemed [illegible] intramuscular injection of 15 gr of hydrochloride of [illegible] by 10 gr of bisulphate of quinine by mouth four times [illegible] then 10 gr thrice daily for one month, 10 gr [illegible] month and finally 10 gr twice daily for a third month

The only species [illegible] that I saw at Kassandra was a large brown mosquito with [illegible] markings on the body wings legs

or antenna The thorax and abdomen were [illegible] hair-like scales Only upright fork scales w[illegible] only lanceolate scales were found on the wings [illegible] absolute uniformity of arrangement and colour on [illegible]

Fig 1 [illegible]

were no aggregations of scales forming wing spots The mosquito in question was probably *Anopheles bifurcatus* It was certainly neither *A. maculipennis* nor *A superpictus*, which are the two commonest varieties of malaria carrying mosquitoes found in Macedonia generally

[illegible] winter season [illegible] in April [illegible] [illegible] and [illegible] Sick [illegible] Station [illegible] in February [illegible] 1918 [illegible] anopheline [illegible] in January 1918, in [illegible] village of [illegible] eleven miles N N E of the camp showing [illegible] anopheline were still alive in the middle of winter [illegible] in the cold water in the district

[illegible] of mosquitoes in 1917 was seen in the vicinity of the [illegible] May [illegible] and followed the men up the hill into the camp [illegible] were mainly culicine and it is interesting to note [illegible] in June 1918 by the escape of hydrogen [illegible] their dead bodies being found on the [illegible] floated down on to the ground It was [illegible] about [illegible] however that the first active female [illegible] were [illegible] in the camp They persisted until the [illegible] of Sept [illegible] all mosquitoes left the camp for a couple of [illegible] with the [illegible] of strong east winds early in November, [illegible] down [illegible] to the camp from the valley and remained with [illegible] [illegible] were seen again about the camp during [illegible] between December 15 and 30 1917 and between [illegible] and 1918

[illegible] in my [illegible] and that the key to the whole situation [illegible] drainage of the marsh The credit for this work is due [illegible] Lt H R Hipperton R N A S and to C P O Edwin [illegible] On [illegible] of December 1916 they made a cutting through the [illegible] the lowest part of the valley and laid a 3 in pipe line [illegible] directly with the sea The cutting closed up again [illegible] the pipe [illegible] and has functioned successfully [illegible] high but large enough to cope with the winter rains [illegible] to keep the lagoon at sea level during the summer [illegible] all the water from the drainage trenches opening [illegible]

During April and May 1917 a long trench was dug through a ridge [illegible] clay some 200 yards long and [illegible] ft high in the centre, which [illegible] between the more distant portion of the marsh and the lagoon [illegible] May and June 1917 numerous springs within half a mile of the [illegible] were drained and connected by small drainage trenches with the [illegible]

The total longitudinal drainage trench dug between March 21 and June 21 [illegible] was 1,500 yds The nearest larger spot was then 1,500 yds distant [illegible] camp and as the summer was already well advanced it was [illegible] to have this [illegible] alone for the time being Its [illegible] was completed during February and March of the [illegible]

[illegible] pay a [illegible] [illegible] [illegible]

CIL HT I

TEMPERATURE
POLYMORPH

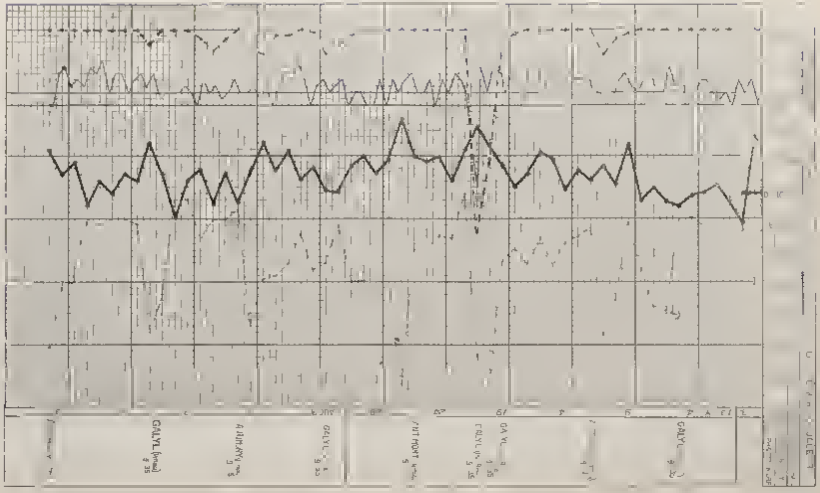


CHART 3

per [illegible] calls [illegible] d the [illegible] is [illegible] first [illegible] gold [illegible] improvement [illegible] gum treated [illegible] with gold [illegible] he appeared with [illegible] trypan[illegible] 1917 he was again [illegible] hospital [illegible] antimony [illegible] ment was continued [illegible] and intramuscular [illegible] zation of the blood [illegible] trypanosomes [illegible] peripheral blood [illegible] examination of film [illegible] (1,000 white cells being counted) they were not [illegible] 1918 when a further course was given and repeated in the [illegible] Thus after five years from the original infection and two years [illegible] from the date when trypanosomes were last found he remained [illegible] to do duty [illegible] this filarial infection. He may [illegible] have been cured [illegible] sleeping sickness. The case [illegible] primarily the value of antimony treatment even in apparently [illegible] cases, and secondarily his uselessness for the cure of filarial [illegible] infections. Animal infection from this strain was established [illegible] in guinea pigs and rats: the first inoculated guinea pig [illegible] months and by passage the toxicity had been so increased that [illegible] the animal only lived two months. The strain was very [illegible] to establish in rats and these as a diagnostic test failed [illegible] as out of six inoculated direct the writer was never able [illegible] trypanosomes in the blood or organs.

The very interesting facts were demonstrated that the [illegible] infection a mother could infect the young through the placenta [illegible] both rats and guinea pigs smears from the organs of the [illegible] showed mature trypanosome forms; secondly that [illegible] and became infected—some might live for three to four months while others showed no sign of infection at all even when suckled by the mother.

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## (p) KALA AZAR

The possibility in the Navy of an increase during the [illegible] of this interesting and severe disease was considered because in the West Indies [illegible] it is not uncommon in the native populations. The epidemiological spread in some instances has been shown to be connected with dogs and dog fleas. The infection is due to the introduction of a parasite a

[illegible] similar to that found [illegible] following characters—very [illegible] infants and [illegible] than adults, cultured more easily on certain media and [illegible] dog fleas Hence called *Leishmania infantum* However [illegible] from the Mediterranean occur in adults the term is thus [illegible] The first case which was under treatment before the war and [illegible] included until December 1914 was that of a private [illegible] contracted the disease at Malta The infection was attributed [illegible] with native dogs which frequented the rifle range the [illegible] employed there on duty for some months All the signs [illegible] distinct and marked the spleen on admittance reaching [illegible] level it was very hard and smooth From it [illegible] cultured and cultured He was treated with intravenous [illegible] 68 in number or 290 gr of the drug, while [illegible] intramuscular injections of a vaccine made from his own [illegible] given—about 15 millions for a dose. When [illegible] spleen were greatly reduced in size and he was [illegible] The recovery was complete for in 1921 he wrote to [illegible] another case was noted an A B who served in the M[illegible] the war and landed at Gallipoli Mudros and Sal[illegible] never played with the children or dogs, was never [illegible] their clothing He was mined in H M S [illegible] 1917 This ship carried a bull terrier and an Irish terrier [illegible] He had been in Malta four times May and June 1911 [illegible] St Michael [illegible]—a place full of fleas The onset of symptoms [illegible] June 1911 when he was sent to Malta hospital with [illegible] weakness enlarged spleen and liver mucous membrane and [illegible] hemorrhages marked wasting and dry skin

[illegible] serum reactions negative R B C 3 700,000 from a liver [illegible] Leishman Donovan bodies were found (it was evident that the [illegible] had been going on for some months) He was sent to the Seamen's Hospital Greenwich in December, 1917 The spleen was down to the level of the umbilicus and almost across to the middle line. R B C [illegible] W C 2 200 Polymorphs 28 per cent only The liver was [illegible] and the film showed liver cells with a quantity of malarial [illegible] he was therefore given intramuscular injections of quinine as [illegible] for a week The white count fell to 1 400 then to 1 200

A [illegible] liver puncture gave negative evidence of Leishman bodies by smear and culture and as a control rich puncture an echymosed area was noted showing a tendency to hemorrhagic tendency it was not considered safe to puncture the spleen He was then put on weekly intravenous injections of antimony tartrate 1 to 2 gr The temperature fell and his general condition improved the spleen and liver steadily decreased in size and [illegible] condition was much more normal R B C 5 400 000, W C 4,000 with [illegible] per cent polymorphs Liver puncture again showed an absence

[illegible] present [illegible] [illegible] well [illegible]

[illegible] these two severe [illegible] and one with [illegible] injections, is important to [illegible] The [illegible] diagnosis of such [illegible] they can be treated [illegible] the necessity of taking the [illegible] to demonstrate the [illegible] in [illegible] suffering from [illegible] forms of irregular fever in the [illegible] of this disease and [illegible] inadmitted by quinine and [illegible] malarial lemipenia

BLOOD COUNTS

| | Red | White | Eosinophiles | Mono | Lymphocytes | Plasmophiles |
|---|---|---|---|---|---|---|
| Malaria | 3,780,000 | — | [illegible] | 17 | 56 | — |
| Gonorrhœa | 3,800,000 | 2,200 | 8 | 12 | 59 | 1 |
| Typhoid | — | 1,400 | — | — | — | — |
| Sepsis | — | 1,200 | — | — | — | — |
| Hookworm | 4,000,000 | 4,000 | — | — | — | — |
| Bilharzia | 4,100,000 | 3,200 | — | — | — | — |
| Cirrhosis | 4,170,000 | 3,100 | 16 | 14 | 17 | 1 |
| Hookworm | 4,130,000 | 3,410 | 7 | — | 28 | 4 |
| Sepsis | 3,140,000 | 1,030 | 67 | 12 | 20 | 1 |

Total [illegible] Total intramuscular (sp) intravenous injections [illegible]

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## PART III.—DYSENTERY (a) LIVER ABSCESS (b) SPRUE AND (c) EPIDEMIC DIARRHŒA

By SURGEON-LIEUTENANT-COLONEL SIR HENRY FASSETT SMITH, K.C.B., C.M.G., F.R.C.S.

### (a) DYSENTERY

The statistical [illegible] showing the general prevalence of this disease during the past [illegible] years is given in the following table:—

| | 1911 | 1912 | 1913 | 1914 | 1915 |
|---|---|---|---|---|---|
| Cases | 40 | 11 | 38 | 501 | [illegible] |
| Admitted to hospital | — | 11 | 19 | 430 | 173 |
| Deaths | 1 | 0 | 17 | — | 6 |

In 1914 H.M.S. *Challenger* reported six cases, mostly amœbic, contracted at Dualla in the Cameroons. These were men landed with the British Expeditionary Force. H.M.S. *Forth* gave six cases contracted at Mombassa and Zanzibar. H.M.S. *Cornwallis* also reported three cases contracted at Duala. The water there was stated to have been very bad and the ship's company was warned not to drink it. Flies were very troublesome and probably carried the germs.

[1] Many cases admitted for other [illegible] 1914 [illegible] 523 out of the total [illegible] Station. The majority were [illegible] infection of the food and water [illegible]

Their [illegible] cases from the Persian Gulf, [illegible], and twenty one [illegible]

In 1917 the average daily number of the total [illegible] was 236,500 men with [illegible] of [illegible] and thirty six deaths [illegible] to the condition [illegible] very large number of mild cases were [illegible] in the Eastern Mediterranean and by the R N Division [illegible] and very many [illegible] for treatment [illegible] of many of these cases was impossible, as [illegible] on arrival at the base hospitals were convalescent without any [illegible] on papers Typhoids paratyphoids, enteritis and dysentery were [illegible] mixed Much work was done at Haslar where the [illegible] were received, but the cases had to be largely diagnosed [illegible] report At Malta Hospital 166 cases of dysentery [illegible] five deaths in one of the latter with true amœbic dysentery [illegible] large liver abscess in a second with severe diarrhœa and [illegible] post mortem was performed emaciation was extreme in [illegible] death generally received from exhaustion In one group of thirty [illegible] cases three died and fourteen were invalided to England In some the course was very rapid one case of acute dysentery died on the fourteenth [illegible] another on the fifteenth day It is stated that some of the cases reacted immediately to emetine in half grain doses others did well under [illegible] in men

At Plymouth out of 601 cases all from Gallipoli there were 12 deaths but most of the patients were convalescent on arrival Slight [illegible] was frequently noticed but in the sub-acute cases little was complained of The fatal cases were intensely emaciated *Entamœba histolytica* *B dysenteriæ* (Flexner X) *Morgan I* and *B fecalis alkaligenes* were [illegible] from stools but systematic examinations were not possible

At the post-mortems extensive ulcerations all through the large intestine and last part of ileum were found the mucous membrane showing [illegible] of destruction the submucosa was thickened and black from [illegible]

In 1916 160 cases were treated at Malta Hospital with 4 deaths [illegible] the cases were from Gallipoli with a few from the East African [illegible] In Egypt Hospital one case was reported in a man who had never been abroad and from whom *B dysenteriæ* (Shiga) was isolated

In 1917 a great number of cases were chronic convalescents on arrival in England Malta Hospital however reported 123 cases with 1 death, 8 of which were amœbic and 36 bacillary At Plymouth there were 45 cases and 1 death At Haslar 89 cases with 1 death Six cases were contracted in France

In 1918 the incidence had fallen considerably but cases from Dakar and the West Coast of Africa occurred one of the former being of a very acute gangrenous character, which caused the death of the patient In 1915 1916 H M H S *Soudan* dealt with 1 406 cases on board 4 of these died there (1 with liver abscess) and 1 398 were transferred to other hospitals

[illegible] cases, of whom died and 77 were transferred to other hospitals. H.M.H.S. *St. Margaret of Scotland* had 107 [illegible] transferred to other hospitals and [illegible] H.M.H.S. *Karapana* in 1914 dealt with 65 cases [illegible] (liver abscess) and 50 were transferred to other hospitals. [illegible] 10 cases, 3 of whom died and 57 were transferred to other hospitals. It is stated that almost all these were bacillary dysentery. H.M.H.S. *Corfu Castle* had 5 cases, 3 of which were from Malta. Mudros had 22 cases with 1 death. Nearly all these cases were derived from the Gallipoli campaign and Eastern Mediterranean. During the four years 10 cases were treated at the Cape Hospital, 19 of which were cured, 1 died, 1 died; they were largely from South-east and South-west Africa. In at least 21 of these cases the disease was complicated with malaria, in the majority of which the latter disease had relapsed many times. All these men were invalided to England. Twenty-eight cases after arrival in England were transferred to my wards in the Seamen's Hospital at Greenwich: 18 of these were contracted at Gallipoli or the vicinity, 2 men from South Africa, 1 from Egypt, 1 from Mesopotamia, 3 from India, 1 from China, 2 were from Persia, and 1 was contracted while a prisoner of war in Persia.

Pathologically, *E. histolytica* cysts were found in 10, twice associated with Lamblia infections. *E. coli* and *nanus* cysts were found 4 times. In 3 positive evidence of Hexamitid infection was obtained, and in 2 no definite evidence of infection was made out, though emetine had been freely given to all. In 1 case from Gallipoli the tongue was very like that of sprue, and there was an unfavorable history. In 1 there was marked tachycardia in M.C.O., and 1 had a marked asthenia. 1 had had frequent relapses, and all had been freely treated with emetine. In chronic cases with no definite signs with a mixed with tomato meal—*mucus appendix*.

Occasionally a cure has been effected by hochlorite and bismuth emetine-iodide chemical in the cysts, when simple treatment had failed. In chronic [illegible] cases the writer has found great benefit follow from washing out of the large bowel with cyllin 1/1000.

The following case is of interest as an example of a chronic amœbic dysentery—history of a man at Bombay in the Eastern Mediterranean, probably contracted in Egypt and the patient at the time being in the R.N.V. He was invalided at Liverpool and at the Tropical Diseases Hospital there amœbic cysts were found and he was treated for fourteen days with emetine. He was transferred to the Royal Naval Hospital at Chatham where he was two and a half weeks on emetine in spite of which the bowels still contained cysts, though there were no subjective symptoms. Early in August 1916 he was sent to the writer's wards in the Seamen's Hospital, Greenwich. He was still nourished and not anæmic. He complained of a burning pain in the abdomen but no thickening could be felt; the organs were healthy and there was now no diarrhœa, but he was mentally depressed. *E. histolytica* cysts were abundant in the fæces.

Daily injections of [illegible] hydrochloride gr. [illegible] four days but they again appeared and he was put on a full course when after the fifth day they disappeared. Beta naphthol was then given but the cysts quickly reappeared and remained fairly constant. He was then given pulv. ipecac. 20 gr., for four nights followed by emetine bismuth iodide for five days, then a bismuth mixture. On the day after the commencement of the pulv. ipecac. no cysts were found and they never reappeared again during four weeks of daily examinations. During the first course he lost some weight but had neither nausea nor diarrhœa. The result was satisfactory and probably a permanent cure was established.

In plating out the fæces daily the writer found that during the emetine treatment of cases there appeared to be a great reduction of *B. coli communis* with a marked increase in non lactose fermenting forms and that on the stoppage of the emetine the *B. coli* gradually increased in numbers until they had practically displaced altogether the previous non lactose fermenting organisms and were then associated with streptococci. These non lactose fermenters did not agglutinate with any known sera or agree culturally with any pathogenic organism.

| Fæces | Fæces | Saccharose | Mannite | Dulcite | Peptone water | Litmus milk | Gelatine | Motility | Gram |
|---|---|---|---|---|---|---|---|---|---|
| + | − | + | + | + | − or − | Acid 1 week | No liquefaction 14 days | + | − |

− − acid and gas

Surgeon Lieutenant Commander O'Flynn, at Malta Hospital, tested twenty five cases of proved Flexner infection on the sixteenth day of the disease and obtained the following agglutination results:

| 1/50 | 1/50 | 1/100 | 1/250 | 1/500 | 1/1,000 | 1/1,500 |
|---|---|---|---|---|---|---|
| 2 | 23 | 16 | 13 | 10 | 4 | 0 |

EXAMINATION OF STOOLS IN 1917–1918.

| | A | B | C | Total |
|---|---|---|---|---|
| Number examined | 231 | 477 | 473 | 1,181 |
| Flexner V. group | 87 | 6 | 6 | 99 |
| *B. dysenteriæ* (Shiga) | 47 | — | — | 57 |
| *B. histolytica* | 17 | — | — | 17 |
| cysts | — | 6 | 2 | 8 |
| Ova ascaris | 1 | 5 | 8 | 14 |
| Ova bilharzia | 1 | 1 | — | 2 |
| *E. coli* cysts | 3 | 20 | 6 | 29 |
| Lamblia cysts | 3 | 14 | 7 | 24 |
| Trichomonas | 4 | 4 | 7 | 16 |
| Trichocephalus | 5 | 8 | 3 | 16 |
| Ankylostomes | — | 3 | — | 3 |
| Dibothriocephalus | — | 2 | — | 2 |
| Negative | 69 | 464 | 465 | 998 |

A represents stools containing blood and mucus.
B " " " no blood or mucus.
C " cases for clearance.

### Patterson. Amœbic Dysentery, Chronic. 1916

| Date | Aug. 4 | 5 | 9 | 10 | 11 | 21 | [illegible] | 27 | 28 | 29 | 30 | 31 | Sept. 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | [illegible] | 18 | [illegible] | [illegible] | [illegible] | [illegible] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Treatment | E | E | E | E | | | | | | E | F | E | F | E | E | E | I | E | I | | | | Bn | Bn | Bn | Bn | | | | | | | | |
| E. histolytica cysts | +<br>+ | +<br>+ | +<br>+ | + | | | + | + | + | + | + | + | + | + | − | | | − | − | − | − | + | − | − | | − | + | | | | − | + | | + |

| Date | Sept. 28 | 30 | Oct. 3 | 4 | [illegible] | [illegible] | [illegible] | 9 | 10 | 11 | 12 | 13 | 14 | [illegible] | 16 | 17 | 18 | 19 | [illegible] | 21 | [illegible] | 23 | 24 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Treatment | | | | | Ipecac | Ipecac | Ipecac | Ipecac | I<br>B<br>I | I<br>B<br>I | I<br>B<br>I | I<br>B<br>I | I<br>B<br>I | | Bismuth | Bismuth | Bismuth | Bismuth | Bismuth | Bismuth | Bismuth | Bismuth | Bismuth | Bismuth | Bismuth | | | | | | | | |
| E. histolytica cysts | − | + | + | +<br>+ | +<br>+ | − | − | − | − | − | − | − | − | − | − | − | − | − | | − | − | − | | − | − | − | [illegible] | − | − | | | [illegible] | [illegible] |

[illegible] in which [illegible] nausea there [illegible] the patient [illegible] the case [illegible] was admitted [illegible] immunation [illegible] six times [illegible] in the onset [illegible] which did not [illegible]

[illegible] nearly 3 per cent were [illegible] these negative findings [illegible] with stools resembling [illegible] intravenous injections [illegible] was of such duration [illegible] A patient death resembling [illegible] it is stated that [illegible] DIAGNOSIS [illegible] only bitten [illegible] with *B. typhosus* [illegible] and once with [illegible] were [illegible] in the six cases [illegible] clear [illegible] Lieutenant Com- [illegible] flagellates [illegible] and in the [illegible] The [illegible] is often [illegible] is [illegible] of these [illegible] and not the cause [illegible]

[illegible] are the commonest [illegible] possible [illegible] cases of relapse [illegible] from [illegible] of tachycardia [illegible] pulse [illegible] In all [illegible] only [illegible] cases [illegible] most common and [illegible] of these [illegible] Surgeon Commander Mackie [illegible] with [illegible] shaft. The usual symptoms [illegible] the bowels with bile [illegible] and [illegible] marked diarrhœa [illegible] the bowels under treatment the [illegible] marked was [illegible] treatment [illegible] there was strict confinement to bed [illegible] intra indicate [illegible] in these cases owing to [illegible] was noticed. In all cases in initial shock [illegible] was given followed by three purgative [illegible] within three hours to establish the flow of bile [illegible] were the given morning and [illegible] was used but did not give good [illegible] possible to determine the pathological

[illegible] at the time Many [illegible]

[illegible] pathological condition of [illegible] Surgeon A M [illegible] disease in the Dardanelles [illegible]

[illegible] was very disturbed and [illegible] the disease in was [illegible] considerable accumulation [illegible] in the [illegible] of the [illegible] and kidneys were [illegible] There was some straining [illegible] the small intestine but no evidence of peritonitis in [illegible] layers Palpation [illegible] and no areas could be [illegible] in which the gut wall was thickened There was no flatulent distention of the viscus

The colon was ligatured off, removed, and opened under water The appearances noted were as follows The whole area of the mucous membrane was involved in varying degrees no areas of normal mucosa being present The ravages of the disease were most marked in the last 30 cm of the large bowel up to and including the anus In this area the whole mucosa was necrotic dirty grey in colour finely granular in appearance and gritty to the touch i e a superficial coagulation necrosis There was no loss of substance such as would be produced by discrete ulceration but some irregular pitted areas were observed, these being in early phase in the production of the ulcers

To the region of the splenic flexure the universal necrosis of the mucosa had given place to small, shallow irregular ulcers of an average diameter of rather less than 1 cm some of them oval in shape—their long axes having no constant relation to that of the bowel Their edges were markedly undermined in many cases to a distance equal to half the surface diameter of the ulcer There was no heaping up of the margins The base in every case was at a lower level than that of the surrounding mucous membrane but no deeper than the submucous layer hence the extreme rarity of perforation in bacillary dysentery Round these ulcers the mucosa was much infiltrated and many areas of the granular necrosis already described could be seen The average distance between the ulcers was 2 to 4 cm The transverse colon presented a similar appearance with the exception that the ulcers were not so numerous

Examination of the caecum revealed an increase in the number of the ulcers which were rather larger than those seen hitherto Otherwise the appearances were as already described for the splenic region of the bowel The peritoneum covering the large bowel was normal as also was the appendix

The most interesting feature of the case was the condition of the small bowel with only minor differences determined by the structure of the viscus the last 10 ft of the ileum showed lesions exactly similar to those seen in the colon There was the same granular coagulation necrosis of

[illegible] with [illegible] [illegible] [illegible]

[illegible]

[illegible]

[illegible]

Local [illegible] disease [illegible] in bacillary [illegible] bacillary [illegible]

[illegible]

[illegible] BRITISH EMPIRE CANCER CAMPAIGN

[illegible] publication [illegible] following —

BRITISH EMPIRE CANCER CAMPAIGN

THE KING'S DONATION

Sir Arthur Stanley has received the following letter from the Right Hon Sir F M Ponsonby —

Privy Purse Office,
Buckingham Palace S W
*June 4, 1923*

MY DEAR STANLEY

I am commanded by the King to send you the enclosed cheque for £100 as a donation from His Majesty towards the Fund you are raising on behalf of the British Empire Cancer Campaign

Yours sincerely
(signed) F M PONSONBY

*The Hon Arthur Stanley G B E, C B*
*19 Berkeley Street W 1*

Sir Arthur Stanley has replied in the following terms —

British Red Cross Society,
19 Berkeley Street, London, W 1
*June 6, 1923*

MY DEAR PONSONBY,

Your letter dated the 4th inst only reached me this morning. Will you please convey to His Majesty our most dutiful and grateful thanks for His Majesty's very generous donation to the fund which we are raising on behalf of the British Empire Cancer Campaign It is a very great encouragement to us to know that in this Campaign we have His Majesty's support and approval

I am,
Yours sincerely
(signed) ARTHUR STANLEY

*The Right Hon Sir F Ponsonby G C V O*

Subscriptions to the British Empire Cancer Campaign should be sent to the British Red Cross Society, 19 Berkeley Street London W 1, addressed to the Hon Sir Arthur Stanley G B E C B or to Lloyd's Bank Ltd its branches

Cheques etc to be made payable to British Red Cross Society and crossed "British Empire Cancer Campaign—Lloyds Bank, Ltd, Not Negotiable

# Clinical and Practical Notes.

## THE TREATMENT OF SYPHILIS ABOARD

By Surgeon Commander T. H. Ferguson, R.N.

The treatment of syphilis on board ships without having [illegible] treatment would appear to be solved by the introduction of sulfarsenol [illegible] now been under trial in the Mediterranean Fleet for the past two [illegible]

It fulfils all the requirements of the efficient treatment of this [illegible] spective of where it may be serving, and it is recommended that it [illegible] be issued to all ships as has been the case on this station for the following reasons:—

(1) When given subcutaneously the results obtained are at least as good as any other drug that has hitherto been used.

(2) The ease and safety of its administration on board [illegible] requires no nicety of technique, nor special apparatus.

(3) It provides a method of treating the infection at the very commencement and before it has become generalized.

(4) It provides for the continuity of treatment which is so essential and which is now so often interrupted by the absence of facilities and the necessities of drafting.

(1) To elaborate these points further, Surgeon Commander Scott has examined the results of treatment by sulfarsenol in this Fleet, and is quite satisfied as the G. U. Specialist of the Fleet that it is an efficient preparation and quite capable of taking the place of N.A.B. on ships, and I will not say more except that it has given uniformly good results in this ship where most careful Wassermann records have been kept.

Of course to assess the value of any drug, the treatment which the patient has received before must be taken into account. But when a patient has been drafted to this ship with a + Wassermann or is recommended a further course of N.A.B. he has been treated with a course or courses of sulfarsenol on board, and as is shown in attached Table A the results are uniformly good.

Fortunately or unfortunately for record purposes there are not many A and B type cases in this ship but what there are show equally good results after treatment with sulfarsenol so that one can rest satisfied that the treatment is efficient.

(2) With regard to the ease and safety of administration on board there can be no question, for it amounts to no more than an ordinary inoculation against typhoid; it is painless at the time of injection and only occasionally has there been any complaint of a sore arm following an injection; the latter point is important, for men will not submit to continuous treatment over a long period if it causes pain or inconvenience or is likely to interfere with their ordinary pursuits on board or on shore.

Sulfarsenol requires no preparation before injection except perhaps a purge the night before and the testing of the urine, and only as a precaution are patients kept in the sick bay on the day of injection when if there is no rise of temperature in the evening after an injection in the morning they return to their ordinary duty.

With regard to the preparation of the compound for injection all that is required is a syringe, preferably with a platinum needle and some distilled water. The drug is supplied in ampoules of 0·48 and 0·6 gram; the neck of the ampoule is broken off and 10 minims (1 c.c.) of water is added to the ampoule, the drug is readily soluble and the solution is ready for injection. According to the

[illegible]

[illegible] water is not considered necessary [illegible] board it is as well to use it

[illegible] into the arm care being taken that [illegible] if the needle on withdrawal

[illegible] number of cases can be dealt are [illegible] have been given in this ship and [illegible] there have been no complications beyond [illegible] and a solitary case of jaundice and [illegible] per cent of the cases returning to [illegible]

It is not the same shock [illegible] N A B administered intravenously and [illegible] there should be [illegible] for use in all ships as his [illegible] case in this fleet [illegible] by Surgeon Commander Kahn [illegible] since all M O R [illegible] in the past two years will endorse the opinion that it is a safe and [illegible] remedy that can be used for service [illegible]

(3) The fact of having a drug [illegible] the intramuscular treatment of all sores is of great importance [illegible] proceed to the stage of [illegible] Wassermann

All ships on the station will [illegible] one or two have microscopes with dark ground illumination [illegible] S P test and if the latter gives positive treatment is commenced straightway. There comes the question of doubtful cases, with cases in which the S [illegible] it is not an infallible test [illegible] carried out by a highly skilled [illegible] but though no S [illegible] may be seen the case may yet be [illegible] of syphilis [illegible] wait for the diagnosis to be checked by clinical signs or [illegible] Wassermann

Salvarsan is equally effective in syphilis [illegible] as is shown by the attached list of cases treated [illegible] S P test is negative in all but they received a half course of [illegible] as a check then [illegible] have been taken and as will be seen the Wassermann has [illegible] negative in the number of months opposite each case —

| Date of [illegible] | Reaction after [illegible] | | | Months |
|---|---|---|---|---|
| March 1921 | S P negative | W negative | T cured is cured | [illegible] |
| May | | | | [illegible] |
| June | | | — | [illegible] |
| | | | | [illegible] |
| | | | | [illegible] |
| August | | | — | [illegible] |
| Sept | | | | 18 |
| | | | | 18 |
| June 1921 | | | | [illegible] |
| Sept | | | — | [illegible] |
| | | | | 6 |
| | | | | 6 |
| | | | — | 6 |
| | | | | 6 |

Of course it will be objected that these were not cases of syphilis and so the Wassermanns are of no value but why wait to prove it [illegible] they are going to be syphilis cases the injection will have done no harm either way, and at any rate there is the satisfaction of knowing that a doubtful case has not slipped into the stage of a positive Wassermann

A venereal sore with even the slightest chance of its being syphilis, in my opinion, should be treated at once as potential syphilis and receive a course of

arsenic for now that we [illegible] heard which [illegible] idiosyncrasy and will [illegible]

It is only by catching [illegible] chest stage [illegible] the appearance of the so [illegible] that we can be sure that they will [illegible] the Wassermann

In one case S.P. [illegible] if positive [illegible] Wassermann and [illegible] S. suggests, that [illegible] [illegible] the [illegible]

[illegible] doses of 0·48 gram and [illegible] [illegible] weeks. If the test [illegible] prophylactic [illegible] with a Wassermann [illegible] three [illegible] Jamie Scott there have been [illegible] all of which have [illegible] Wassermann [illegible] end of three [illegible] and one wonders how many [illegible] will have [illegible] Wassermann [illegible] left untreated in the very [illegible]

[illegible] does not the objection that you are needlessly subjecting a [illegible] to a [illegible] of an intermittent injection for its experience has [illegible] and said it the case is fairly put before the patient he [illegible] to the prophylactic injections and no case of refusal has occurred [illegible]

[illegible] that the cost of treating all undiagnosed sores would be excessive [illegible] considered that with the number of injections may have to be given if a patient gets [illegible] Wassermann added to the cost of the periods treatment in hospital [illegible] the loss of his services the total cost of his treatment will be outweigh the total cost of the prophylactic treatment

(b) With regard to the continuity of treatment this again is assured by having [illegible] arsenol in the ship many cases are drafted to foreign stations and single [illegible] on detached service with a recommendation for a further course of treatment [illegible] frequently this cannot be given up to time owing to ships being away from [illegible] for prolonged periods by the intravenous use of sulfarsenol there can be [illegible] for any case not receiving treatment at the proper interval

To sum up without in any way wishing to put forward exaggerated claims for [illegible] we have at hand a drug which if issued to all ships at least provides [illegible] and effective treatment on board and in cases of continuing treatment [illegible] may form the usual facilities available in hospitals and depots

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## TREATMENT OF SYPHILIS ON THE MEDITERRANEAN STATION

By Surgeon Commander [illegible] R.N.

The treatment of syphilis by arsenical compounds has been a rogue in the Navy for about fourteen years and during this period has undergone many changes. Salvarsan gave place to salvarsan then followed neo-salvarsan, kharsivan, neo-kharsivan, galyl, novarsenobillon, gluearsenol and sulfarsenol. The amount of the compound given in a dose and the number of doses considered necessary have been several

Its natural development was upset by the war which demands made it necessary to send men out of hospital at the earliest moment, often before a sufficient course had been given and caused much difficulty later when the cases should have been sent to hospital for second or third courses

We have however learnt a great deal during those years. The early optimism [illegible] has gone and seems to have been replaced by somewhat unjustifiable pessimism which is partly due to a lack of appreciation of certain factors in the treatment and course of the disease

The [illegible] of syphilis is its amenability to [illegible] treatment. This does not [illegible] stration of lesions a month after [illegible] pearance of the primary lesion [illegible] A delay of one month [illegible] plus a positive blood test [illegible] ing, or two full courses instead [illegible] thus every thing [illegible] tone to make it a reliable and [illegible] delay.

Treatment [illegible]

In regard [illegible] N A B [illegible] intensely what constitutes [illegible] course. Some give 2 7 [illegible] 10 [illegible] a period of [illegible] thirty days. Personally I [illegible] under 18 grs is [illegible] practice. At Malta [illegible] for some [illegible] looking through card [illegible] this station and it [illegible] appeared to me to be very good.

As regards intramuscular or subcutaneous sullarsenol the practice on this station has been to give a course amounting in all to 1 gm and spread over fourteen weeks. It appears to be good in regard to its effect on the Wassermann reaction. In the Mediterranean card index the results are [illegible] sufficient to enable an accurate judgment to be formed of its value as a [illegible] course for which at first sight it does not appear intensive enough. I think it would be better to shorten the interval to one week instead of two weeks between each injection.

One reason for the lack of records of sullarsenol treatment [illegible] early cases is the procedure in regard of giving arsenical injections to all men with general scores without waiting for the Wassermann reaction to be done. In the Mediterranean Fleet record there are 72 of such cases 40 treated by sullarsenol and 36 by N A B. All of these have been negative when examined three months after cessation of treatment and in many the observation period extends much longer.

One cannot deduce the value of sullarsenol treatment as a cure for the number of syphilitic infections is unknown and [illegible] subsequent it appears that the true cure rate is more frequent here than in England. In regard to these cases it is advisable to be guided by the incubation period whenever this is quite definite—unfortunately it is not very common occurrence. The interval is only a few days up to seven it is not worth while bringing a sailor ashore from the dockyard upwards it certainly is.

If not treated by arsenic, blood tests should be carried [illegible] to include three months from the appearance of the sore but it is frequently happens that the appearance of a positive reaction is delayed for this period.

Beware of weak positives in early cases for many of these without treatment are negative in future tests.

Their value in the older cases is open to much criticism. Surgeon Commander Hitch, in the autumn number of this Journal [illegible] —

"With regard to the intermediate results the weak or very weak positives the doubtfuls the ± the negative hot positive well [illegible] one need say very little. Obviously the more I delete the test simple the more if these intermediate results will be obtained. I am convinced that their practical value is very little."

One at times thinks that the serologist is trying to hide the [illegible] inaccuracies and the uniformed nature of Wassermann's reaction behind a smoke screen. Certainly we do not want a greater degree of [illegible] (or shall we say "inaccuracy") until we know what are the determining factors in the reaction.

There is one thing in the treatment of these criterion and numerical scores that is not logical. The original intention was I believe to give the six full doses of N A B 2 7 gr (the Hoslar course for [illegible] type cases in 1919). On this station it has been rendered in terms of half courses. A unit course of sullarsenol is here taken as one of 4 gms and so the suspect gets 2 gms often less.

[illegible]

[illegible] should probably [illegible] make them as short as possible [illegible]

[illegible] month [illegible] treated [illegible] the majority of blood tests [illegible] months. Most of those that [illegible] about [illegible] This is the point then when [illegible] a second course should [illegible] than three [illegible] the cessation of the first course.

[illegible] all the spirochaetes [illegible] till they [illegible] to kill them? We are not [illegible]

[illegible] very clearly the immense value of [illegible]

[illegible] of inquiring into the effects of [illegible] and dispiriting, but only by [illegible] the perspective of the subject and to appreciate the [illegible]

[illegible] due to [illegible] optimism for during many

[illegible] or far too [illegible]

[illegible]

[illegible] organisation [illegible]

[illegible]

Sec [illegible] the [illegible] compo [illegible] to [illegible]

[illegible] many [illegible] later [illegible]

Th [illegible] blood [illegible]

[illegible]

The first [illegible] list of [illegible]

[illegible]

[illegible] ineffectuall [illegible] to [illegible] nurses can [illegible] the difficulty of this, [illegible] reactions makes the [illegible]

[illegible] given a chance to [illegible] progression under [illegible]

[illegible] much to reduce [illegible] initial stage of these con[illegible]

[illegible] ematous rashes and febril dis[illegible]

turbance following injections by a few hours or days may occur. They call for care in subsequent procedure. A three days' course of calcium lactate 20 to 30 gr. per diem seems to prevent their recurrence.

Exfoliative dermatitis follows occasionally. Alkaline baths, zinc oxide ointment and ichthammol soap seem to be most generally employed.

Jaundice appearing some months after treatment is less frequent than after N.A.B. I have never seen a severe case, that is, one that gave rise to any anxiety.

*The Combination of Mercury with Arsenical Treatment.*—When we compute an arsenical course at 4 gm. it is not because in all cases we consider this enough but because we do not consider it safe to give more. Arsenic taxes both liver and kidneys, and mercury we know can also damage the latter. If the excretory system is inefficient the mercury injections become dangerous.

If mercury is given arsenic must be reduced and as the latter is so intensely toxic a powerful but a sparing bactericide such reduction is illogical.

Why fiddle about with bad tools when better are available?

For the same reason it should not be employed between arsenical courses, the period is for rest. It is most undesirable to plant a second arsenical course on an oil excretory system.

There are some interesting remarks in the January and February numbers for 1921 of the *Medical Science Abstracts and Reviews* on the increased toxicity of 606 and 914 compounds when treatment is combined with mercury. The 1920 October number of the same periodical gives a summary of "The Salvarsan Inquiry in Germany." In this the suspicion that mercury adds to the danger of salvarsan coexists is also expressed.

If a course of 4 gm. is spread over such a long period as fourteen weeks it is probable that mercury is not harmful. These long courses are not very satisfactory because they are liable to be interrupted by drifting, recommencing, etc. I think it would be much better to cut the mercury out and to reduce the intervals between the sulpharsenol injections to one week instead of two. From my experience at Plymouth I know this to be a perfectly satisfactory procedure.

The long and mild courses bear the stamp of "latency producers" and will claim respect for some time yet.

Mercury should be reserved for the old cases, the failures of a better treatment. Combined with iodides and given for two or three months each year it may avoid few troubles, lead them to their old age. Should active signs appear, however, they are best dealt with by mercury followed later by mercury and iodide.

*Card Index Records.*—Amongst the ships and establishments in the Navy there are twelve of these. Many cases have index numbers from three different establishments. On the station alone there are two such recording systems. Both must be ineffectual certainly the Fleet one is. In spite of this latter having been in operation for nearly four years it cannot now and probably never will, be able to supply information in which is worth publishing.

A man serves two and a half years on the station. He probably gets syphilis during his first year. He is treated during the second and leaves shortly after. Information as to subsequent progress is very seldom received. I think that the multiplication of these recording systems is at the root of this evil. What small effort there is in posting these card index systems with information is dissipated amongst so many.

Below is appended the only information which the Mediterranean Card Index in supply.

The Wassermann results below were all taken at least three months after cessation of the last treatment, and some are as much as two years after.

A type cases — primary lesion positive spirochaete test negative Wassermann.

B type cases — primary lesion positive Wassermann.

C type cases — any case of syphilis of longer duration than three months.

| | | | |
|---|---|---|---|
| [illegible] treated by | | | |
| Sulfarsenol | 7 cases | All negative | |
| N A B | 12 | 10 negative | 2 positive |
| (Both positives received only 2 gram intramuscularly.) | | | |
| 8 cases— | | | |
| By sulfarsenol, one course | 2 cases | 7 negative | 2 positive |
| By N A B | 51 " | 40 " | 11 " |
| 6 cases By one course only— | | | |
| Of sulfarsenol | 18 cases | 4 negative | 14 positive |
| Of N A B | 37 | 10 | 27 " |
| (Probably these negatives will all become positive.) | | | |
| By two courses (3 to 6 months between them)— | | | |
| Of sulfarsenol | 6 cases | 2 negative | 4 positive |
| Of N A B | 15 " | 3 " | 12 " |
| Of N A B sulfarsenol | 17 " | 11 " | 6 |

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## FRACTURE OF THE PENIS

BY SURGEON COMMANDER HORACE L. R. STEPHENS, O.B.E., M.B., F.R.C.S., D.T.M., R.N.

The rarity of this condition together with its grave resultant disability form sufficient justification for recording the details of a case which came under my care at the Royal Naval Hospital, Haslar. Wilensky [1] refers to the accident as being a most unusual one although several textbooks mention it and add a gloomy prognosis.

*Clinical Notes.*—On January 29, 1923, a heavily built stoker was admitted to Haslar with an injury to the penis. During the act of sexual intercourse with his wife, he stated that he moved "awkward like." He both felt and heard the penis "snap." Erection was lost at once and yet the organ began to swell up. No pain was experienced and he slept again.

On examination it was noted that a free haemorrhage had occurred into the subcutaneous tissues; the whole of the penis and scrotum was black but the glans remained pink peeping out from underneath the swollen prepuce. Three inches from the root a firm rounded swelling presented in the left corpus cavernosum. This varied in size but not in consistence from day to day. Distal to it the organ was oedematous, turgid and stiff in a state of passive congestion. The proximal half was supple.

By February 10 the subcutaneous effusion had been completely absorbed and the penis had regained its normal colour. The lump in the corpus cavernosum remained however and the terminal part of the penis was functionally useless. Attempts at erection enlarged and hardened the swelling while the distal portion of the organ drooped. This evident loss of function produced a very unfortunate effect on the patient's mind. He became morose and melancholy, brooding over his disability. As the mental state was progressing rapidly from bad to worse operative measures were undertaken with little prospect of success.

A longitudinal incision was made, exposing the tunica albuginea. On dividing this a clot of blood the size of a cherry was evacuated. Sharp hemorrhage occurred immediately owing to an artery on the proximal and median aspect of the cavity which spurted vigorously. A main branch of the artery to the corpus cavernosum communicated directly with the venous sinus. This was ligatured and the cavity obliterated by excising the outer wall and accurately uniting the cut edges of the tunica albuginea.

[illegible] the depressed mental state disappeared [illegible] [illegible] d In a letter written after a fortnight [illegible] [illegible] and perfect as before the accident [illegible] [illegible] estimated from his subscription fees, I remai[illegible]

[illegible] given above do not differ materially [illegible] [illegible] On the other hand it is doubtful whether [illegible] simple haematoma When the tunica intima [illegible] the fibrous tissue running through the corpus [illegible] the branches of the main artery will be torn as well [illegible] and the condition of aneurismal varix, and the above [illegible] which was performed in operation

[illegible] may be either expectant or operative If [illegible] cases the patient remaining healthy and relieved [illegible] from the resultant fibrosis gets the left over to [illegible] may be Both Gegen and Michon recommend [illegible] opposing the torn surfaces accurately [illegible] and healing Operation should be postponed [illegible] been recommended which usually takes place to [illegible] have left certain days will diminish the likelihood [illegible] to the concurring fibrosis

REFERENCE

[illegible] Vol. [illegible] Sept. [illegible] 1913 p. 40

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## TENNIS ELBOW

[illegible] WILFRIDGAR WHITE

[illegible] complaint occurred in the district in which I [illegible] as he was himself amongst the patients [illegible] of now old fashioned practical doctor [illegible] pain in the region of the elbow joint [illegible] this term may possibly cover [illegible] the cases which come under the writer's [illegible]

[illegible] of malice onset and causes a kind of [illegible] and it seems to be frequently the first [illegible] to seek relief regarding the injury as due [illegible] in the opinion of the author the pathological [illegible] of muscles of the extensor [illegible] of the forearm at [illegible] external condyle of the humerus and [illegible] the [illegible] and the elbow Later on it may be [illegible] extension of the inflammation [illegible] Thus [illegible] the extensors longus and brevis the [illegible] tendinous digitalis minimus and the [illegible]

[illegible] muscles as the anconeus and the supinator [illegible] that anatomical dis[illegible] [illegible] which the muscles collect [illegible] in this particular spot is the [illegible] the supply being less generous as the [illegible] them in their more likely parts [illegible] of the extensors of the wrist in

[illegible] and is analogous to the [illegible] which is so [illegible] lons lower down the [illegible] in the [illegible] how to using a rocket [illegible] will [illegible] that the medical [illegible] is [illegible] lor more than [illegible]

[illegible] group of muscles [illegible] the rocket is the [illegible] [illegible] across a [illegible] [illegible] whose [illegible] [illegible] supporting [illegible]

[illegible] kinds. The [illegible] part [illegible] the fall of [illegible] inflamed [illegible] there is the [illegible] of muscle [illegible] lones that the [illegible]

[illegible] tightly [illegible] with the palm [illegible] the extent [illegible] will be [illegible]

[illegible] present the [illegible] [illegible] the fall [illegible] [illegible] [illegible]

[illegible]

[illegible]

[illegible] the lor [illegible]

In th [illegible] from [illegible]

Since [illegible] of wood [illegible] lorged [illegible] fall [illegible] chow

## A CASE OF MALIGNANT ENDOCARDITIS.

By Surgeon Commander R. W. G. Stewart, O.B.E., M.B., R.N.

W. P., aged 38, Corporal, R.M.L.I., admitted October 16, 1922, with the following [illegible]: General malaise of three or four days' duration. Reported sick [illegible] with acute pain in left side of abdomen and left groin, which had [illegible] considerably during the forenoon; temperature 97·6° F. Marked tenderness in the splenic region and in the region of the left iliac vessels just above Poupart's ligament. Some hours later he had a rigor followed by profuse sweating. Temperature reached 104·6° F. [illegible] discharged to hospital [illegible].

*Condition on Admission.*—Temperature 101·1°. Pulse 86. Complained of [illegible] pain in left groin, hindquarter and thigh. A very tender swelling was felt in the centre of left groin, and there was tenderness in the left hypochondrium; but the pain had considerably diminished since the morning. Patient gave a history of having suffered at times from shortness of breath, palpitation, and [illegible] of breath on exertion. He stated that three months previously he had been under treatment for throat boils, which kept him in bed for about a week. No history of scarlatina, tonsilitis, or diphtheria. On examination of the heart a loud double sort of bruit was audible together with a rolling, presystolic murmur at the apex (Duroziez's murmur). Slight bulging of the precordial area. Apex beat displaced ten inches outwards and visible over a [illegible]. Impulse strong and heaving. Exaggerated pulsation of the vessels of the neck. Capillary pulsation present. Pulse regular and of water hammer type. Systolic blood pressure 160. Liver enlarged. Slight jaundice present. Spleen enlarged and tender. Urine contained a trace of albumin. No blood or casts present.

*Progress of Case.*—Pain and swelling in left groin subsided. Moderate pyrexia of a remittent character continued, but only on a few occasions exceeded 100° F. No further severe rigors occurred, but he frequently complained of a feeling of fullness which was followed by more or less profuse sweats. Malignant endocarditis of the cardiac type was diagnosed. The source of infection could not be traced, but it was probable that the disease was due to secondary infection of previously damaged valves. Repeated bacteriological examination of the blood failed to show the presence of specific micro-organisms. Fourteen days after admission patient complained of a very painful acute pain in right forearm about [illegible] from the head of elbow. This was accompanied by great temperature [illegible] and later by profuse sweating. There was tenderness on pressure over the painful area, and two days later a swelling was palpable, caused by embolic [illegible] of one of the smaller vessels. The acute pain subsided in a few days, but [illegible] remained for some time, and patient stated that the forearm felt heavy [illegible]. Circulation in the forearm in close site of infarct is reduced and good.

[illegible] a well marked aneurysmal dilatation in the upper third of forearm [illegible] increased in size. A tumefaction is now felt over it. The [illegible] was not affected, but after some time the pulsation in the artery became [illegible]. The aneurysm increased to the size of a tangerine orange, and much [illegible] from pressure on surrounding parts. There was considerable [illegible] in the forearm and hand. Edema of fingers and dorsum of hand was [illegible]. Patient complained of numbness and tingling in the fingers and dull [illegible] pain in forearm. Anæsthesia corresponding to the area of [illegible] was present.

[illegible] suddenly became considerably [illegible] and pulsation much reduced in [illegible]. But to and fro murmur was constantly present.

[illegible] patient was seized with very acute pain in splenic region [illegible] shortness. There was marked tenderness over the spleen [illegible] increased on inspiration. The pain slowly subsided and sweating

became less profuse Signs of failure of compensation now became apparent Action of heart was very tumultuous the large vessels in neck throbbed violently, insomnia and restlessness developed together with depression and drowsiness. Breathing was rapid and becoming more laboured congestion of lungs increased and from December 7 onwards haemoptysis was marked Patient died suddenly in his sleep on January 2 1923

The course of the disease was not influenced by drugs Alkalies salicylates, quinine arsenic and sulpho carbonate of soda were tried without any benefit The same remarks apply to antistreptococcic serum (polyvalent) which is reported to have given good results in a few cases of this disease

*Post mortem —Thorax* veins of neck and thorax dilated and filled with blood About 10 oz of serous straw coloured fluid in each pleural cavity No pleural adhesions Lungs congested but showed no pneumonic change or infarction Heart was very much enlarged and dilated Washed free of blood clot it weighed 14 oz The mitral valve showed two small calcareous vegetations adherent to the chordæ tendineæ but this valve was apparently competent

The three cusps of the aortic valves were destroyed and replaced by large masses of calcareous vegetations There was no marked atheroma of the aorta Small patch of old pericarditis near the apex

*Abdomen* —Liver greatly enlarged (114 oz ) and congested (nutmeg) Spleen very enlarged (29 oz ) firm in consistency and dark blue in colour A large white infarct was present at the lower pole Both kidneys were enlarged and congested

*Right Arm* —From immediately below the head of elbow to 3 in below the wrist joint the right forearm was occupied by a large aneurysm The tumour which was full of dark red clot was deep to the flexor muscles of the forearm and in immediate contact with the ulna anteriorly on inner side, and posteriorly The periosteum covering the bone on these surfaces was destroyed and the bone showed superficial erosion The radius was not affected but the interosseous membrane was destroyed The aneurysm apparently originated in the posterior interosseous artery

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## A CASE OF DIAPHRAGMATIC HERNIA

By Surgeon Commander R H. MORNEMENT O B E, R N

W H W aged 41 Patient complained to his wife on November 5, 1922, of wind pain in the stomach and loss of appetite

On November 7, as he had vomited several times he reported at infirmary, and was placed on the attending list stating he had a bad attack of indigestion his appearance suggested gastritis of probable alcoholic origin

Examination of chest revealed nothing abnormal the abdomen was flaccid with practically no tenderness over epigastrium, where he stated the pain had been severe His mouth was very septic the teeth being in a very decayed condition He was given an alkaline bismuth mixture and advised to see the dental surgeon, when his indigestion improved

On November 5 seen in the morning and stated he felt better Medicine continued No vomiting

On November 9 as he had vomited again during the night he remained in bed at his home and was seen by a medical officer who ordered his removal to R M A Infirmary where he was admitted on the same day

Examination again revealed nothing abnormal temperature 98° F pulse 80 He stated he had lost considerable weight during the last month or two He was given of rhum 1 oz Bismuth mixture continued, and placed on a diet of milk and soda water in small quantities

On November 10 epigastric pain was much easier, there was no pain on palpation of abdomen, he had vomited about two pints of clear coloured fluid

during the previous afternoon pulse normal temperature normal [illegible] had not been open, he was given a simple enema with a fairly satisfactory [illegible] He felt generally better during the afternoon, and said he felt hungry [illegible] a poached egg on toast at 4 p m As he had only slept indifferently the previous night he was given pot brom 20 gr at 10 p m

On November 11 at 7 a m the patient in the next bed called out to him that it was time to wake up and on receiving no answer discovered he was dead

No one in the ward had heard or noticed anything during the night When seen by M O shortly after 7 a m he appeared to have been dead about six hours death had apparently been sudden the vessel next his bed contained about a pint of dark odourless fluid resembling coffee grounds

*Post mortem Examination* —Body well developed and fairly well nourished No evidence of injury

Brain and its coverings normal

Thorax Right lung normal A tumour about size of a golf ball was found outside pericardium which appeared at first to be part of left lung Closer examination swelling was found to be distinct from lung and to contain fluid Laying it further down it proved to be stomach which had penetrated the diaphragm about an inch outside the centre of its left half The tumour in the thorax consisted of about half the stomach starting about two inches from the œsophageal opening and including about two thirds of the greater curvature it had pushed the heart up and to the right, and the left lung (which was somewhat congested) upwards and outwards

Heart and valves were normal There was slight atheromatous change of aortic arch On the under side of the diaphragm there was a conical depression with a base about size of a five shilling piece a perforation at its apex about the size of a half crown When stomach was pulled through into abdomen, the surrounding tissue was stretched and thin There were no adhesions

Stomach was slightly dilated and contained about one pint of dark coloured fluid which could be expressed from the thoracic part of the stomach into the abdominal portion On opening the organ there was considerable congestion of the mucous membrane, more marked in that portion which had been in the thorax, but no evidence of any perforation or ulceration

Intestines were normal and almost empty

Liver Slight enlargement with early evidence of fatty infiltration but no congestion

Kidneys spleen and other organs normal

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## A CASE OF ACUTE EXFOLIATIVE DERMATITIS FOLLOWING N A B

By Surgeon Lieutenant Commander H B B Hull R N, and Surgeon Lieutenant Commander J A O'Flynn M B R N

This case though in the main typical shews some unusual features. W S P stoker aged 20 was admitted to the Royal Naval Hospital, Chatham, suffering from syphilis on October 21 1922 Date of infection, August 7, 1922 sore appeared October 11 1922 He had marked balanitis with an œdematous phimotic prepuce which was slit up condylomata general adenitis alopecia and eczema *Treponema pallida* demonstrated in condylomata October 22

Treatment 3 85 grm N A B in eight intravenous injections over a period of one month and fifteen daily mercurial inunctions of 1 dr until he developed sore gums on November 17

*November* 23 the day following his last injection of N A B, a morbilliform rash appeared over the trunk Severe coryza and conjunctivitis Temperature normal

*November* 25 rash fading desquamation on the face Solid œdema round lips

[illegible] Fresh laryngeal cough Larynx inflamed and œdematous [illegible]

[illegible] *to December* 1 Temperature remained normal œdema of larynx [illegible] more marked causing aphonia and dysphagia

[illegible] 2 Throat condition easier, a bright red erythematous rash all over the body more marked œdema of the face and general thickening of the skin all over the body especially marked on the scrotum

*December* 3 *to December* 7 Œdema and thickening of the skin and rash more marked Eyes closed

*December* 8 Desquamation started, general tendency to cracking, fissuring and dryness of the skin Temperature 103 F Fresh exacerbation of the œdema of the throat

*December* 9 *to December* 13 Mild pyrexia, laryngeal condition unchanged. Free desquamation in large flakes all over the body Skin bright red in colour

*December* 13 Passed three stools each containing some ounces of bright red blood No signs of hæmorrhoids. This ceased without any special treatment and there was no recurrence. Patient was wasting rapidly and great care had to be taken to prevent bed sores

*December* 15 Started to improve

*December* 27 Redness of skin disappeared, but thickness and dryness remained especially marked in axillæ wrists and on pubes. Laryngeal condition improving

*January* 30 With exception of some pigmentation skin normal but patient still wasted

TREATMENT —Laryngeal condition which was very alarming treated by steam tent with 0 01 of per manganate and calcium lactate 30 gr daily The gradual onset and general condition led us to conclude that adrenalin would have no permanent effect on the condition

*On December* 6, intramuscular injections of intramine were started He was given 15 c c in six injections over a period of one month during which time the condition showed a gradual improvement and we are of the opinion that the intramine was of decided benefit Ichthyol was not given.

Urine condition varied At times normal at other times it contained a trace of albumin On December 9 only did it show a cloud of albumin and then it also contained blood No casts were detected at any time

Wassermann reaction from October 22 to November 18, positive, since then consistently negative

BLOOD CONDITION

| | November 25 1922 | December 15 | February 15 1923 |
|---|---|---|---|
| Hæmoglobin | 80 per cent | 70 per cent | 80 per cent |
| Leucocytes | 11 200 | 25,800 | 9,200 |
| Erythrocytes | 5,504 000 | 5 384 000 | 5,144 000 |
| Colour index | 0 70 | 0 66 | 0 78 |
| Polymorphs | 50 0 | 61 5 | 50 5 |
| Lymphocytes | 13 0 | 24 5 | 36 0 |
| Large mono } Transitional } | 18 0 | 10 0 | 9 5 |
| Eosinophiles | 8 0 | 5 0 | 3 5 |
| Basophiles | 1 0 | | 0 5 |

Erythrocytes show slight basophilic staining

The condition is in no way due to syphilis but is due to poisoning by arsenic in a specially susceptible patient The unusual features are the marked œdema of the larynx, apyrexia during the acute initial stage the hæmorrhage from the bowel, the presence of blood in the urine the marked leucocytosis (Parnell describes a leucopenia as being a characteristic of this condition) and the basophilic staining of red cells

# Reviews.

[illegible] AND THEORY A Textbook for Students [illegible] By [illegible] H O B E M D London William [illegible] Ltd 1922 [illegible] 6 figures 48 Price 25s net

[illegible] dealing with [illegible] history and historical chapter, which gives a sys[illegible] and comprehensive [illegible] history of the attempts that have been made to [illegible] surgical anæsthesia from those recorded in ancient script to the writings [illegible] present day, including lessons learnt from the experiences of the recent European war, the author shows that with progress in the art of giving anæsthetics, the professional status of the anæsthetist has advanced In separate chapters the author deals with the definition and nature of anæsthetics, the physical and chemical nature of each the physiological action of chloroform ether, nitrous oxide ethyl chloride and less commonly used anæsthetics such as amylene ethyl bromide &c A series of chapters follows on the administration of anæsthetics including the many agents for producing anæsthesia

Chapter XV goes very fully into the question of the choice of anæsthetic considered according to the special circumstances of cases likely to be met with

The remaining chapters deal with the preliminary use of narcotics and other drugs, posture of the patient undesirable conditions of the patient during anæsthesia accidents and complications unusual uses for anæsthetics, local anæsthesia, and spinal and sacral anæsthesia The concluding chapter discusses the limitations of anæsthesia

We do not think a better book on this special subject has been published and D Blomfield is to be congratulated on having achieved so valuable a work The publishers too are to be congratulated on the excellence of the type paper and binding

ORTHOPÆDIC APPARATUS By F G Ernst Orthopædic Mechanician to the Royal National Orthopædic Hospital the Royal Surgical Aid Society H M Ministry of Pensions, Royal Air Force, &c London The Whitefriars Press, Ltd [illegible] pp 106 with 198 illustrations.

The author of this book has devoted many years to the invention and production of remedial apparatus and his unrivalled experience more than justifies the publication In this volume Mr Ernst gives a full and helpful account of the difficulties he has had to overcome in remedying deformities and in supplying artificial limbs to amputés

Mr Ernst urges the importance of close co operation between the surgeon and orthopædic mechanician in dealing with every case a fact which is realized to the full only by the orthopædic specialist The chapters on artificial limbs and the chapter on abdominal belts and trusses particularly merit the attention of naval surgeons Therein they will find matter particularly helpful to them in their surgical work in the Service and they will be guided in their choice of method of amputation by learning from Mr Ernst the type of limb that can be supplied

This book has been carefully written and well produced and should be a valuable addition to the libraries of naval medical establishments

AMBULANCE COMPETITION TESTS (Stretcher, Individual and Question) By N Corlett Fletcher M B, M R C S, &c London John Bale Sons and Danielsson Ltd Price per folder 3d

This is an invaluable series of folders which contain up to date tests, with detailed marking sheets based on the St John Ambulance Association Manual, and prepared for ambulance students, especially those training for competitions

As the author of several Manuals of First Aid Dr Hatcher is well qualified to compile these interesting cards

The folder under review (No 3) contains a combined exercise for the full stretcher party followed by individual tests for each member The tests are very well thought out and each step in treatment is allotted certain marks At the end are some very astute hints on Competitions

There is no statement as to the scope or number of folders in the series but judging by No 3, these cards would be of enormous assistance to anyone called upon to set a test or judge a competition in First Aid work. G O M D

A Monograph on Gonorrhœa By A Keith Fraser, M D (Aberdeen) Lecturer in Venereal Diseases University of Cape Town Honorary Visiting Venereologist New Somerset Hospital Cape Town Major, S A M C &c London Henry Kimpton, 1923 Pp x + 283 with 56 illustrations and 49 plates Price 18s net

This book is a very complete monograph and at the same time an extremely practical guide to the diagnosis and treatment of gonorrhœa and its complications The author, while giving a sketch of the various methods of treatment that have been tried, indicates definitely and in detail the procedure he has found most useful in practice

He emphasizes the point that gonorrhœa must be regarded as a general systemic disease and not merely as a local affection He does not consider the urethroscope of as much value as most, and would assign rather a minor role to it in treatment On the other hand will many would agree with his recommendation of prostatic examination at such an early stage as at the end of ten days He believes in urethro vesical lavage from the first in acute gonorrhœa and considers the irrigating Kollmann dilator the most valuable form of treatment in chronic urethritis

Chapter XVII on metastatic complications and Chapter XX on non gonococcal urethritis are especially valuable

This is a book that can be recommended to all who make a serious study of gonorrhœa as well as a guide to those who are not so familiar with the disease

Translation of Selected Passages from De L Auscultation Médiate By R T H Laennec with a biography by Sir William Hale White K B E M D London John Bale Sons and Danielsson Ltd 1923 Pp x + 193 with 8 plates &c Price 12s 6d net

In 1816 Laennec examined a rather fat young woman presenting symptoms of disease of the heart Being unable to examine her heart by direct application of his ear to the chest on account of her age and sex he took a sheaf of paper and rolling it up into a tube, listened to the heart sounds through it To his surprise he heard the hearing of the heart more clearly than he had ever done before

He then set to work to find out what was the best material and shape for a stethoscope and to correlate the sounds heard through it with post mortem findings So accurate were his observations that the account of them in this book first published only three years later has hardly been excelled in any particular to this day In fact many of the signs which he used in describing pectoriloquy, ægophony and other signs may be found in the latest edition of Clinical Methods

The book was partially translated into English in 1821 by Forbes, who doubted whether the method would ever come into general use as it was so laborious and undignified Humorous artists still like to draw a doctor listening to his patient's chest through a wooden stethoscope and, with unconscious

[illegible] rly always [illegible] the doct[illegible] [illegible] of the [illegible] ing the ear piece to the patient's ear

[illegible] was soon realized to be invaluable and the British Admiralty [illegible] years ago issued an order that naval surgeons were to [illegible] with the use of the stethoscope

This [illegible] excellent idea of Laennec's own views on the subject and also [illegible] many of his discoveries concerning pulmonary tuberculosis and many [illegible] diseases of the chest for Laennec was amongst the earliest physicians who made a regular practice of correlating the symptoms and signs of their patients during life with post mortem appearances

The biography and appendix, by Sir W Hale White are short but sufficient and the whole book is pleasant to read, interesting and of a handy size and shape.

IMPOTENCY STERILITY and ARTIFICIAL IMPREGNATION By Frank P Davis, P L B M D Fellow of the American Medical Association &c Second edition London Henry Kimpton 263, High Holborn 1923 Pp 163 Price 9s net

This book considering its brevity deals comprehensively with the subjects under description although there is nothing particularly new in the theories advanced nor in the lines of treatment suggested

The relationship between the sense of smell and the tissues of the nose with the sexual instinct is well described

The list of drugs recommended by the author for the medicinal treatment of impotency is fairly exhaustive but some of the remedies suggested remind one of the "love philtres" of the Middle Ages The advocacy of gold as an aphrodisiac recalls to one's mind the claims made by Hahnemann—that one quadrillionth of a grain of this precious metal would produce prolonged and uncontrollable sexual desire With reference to this it may be remarked by the way that a contemporary critic of the great homœopathist pointed out the potential dangers arising from gold stopping in teeth

One feels inclined to the view that the circumstances which justify begetting a child by such highly unnatural means as artificial impregnation must be so rare that the importance of this operation cannot be very great

It is surprising that such mild censure is passed by the author on a Professor Pancoast who is reported to have performed the operation of artificial impregnation upon a patient under an anæsthetic without the knowledge or permission of the woman or her husband Dr Davis's comment with regard to this incident is It doesn't speak well for Professor Pancoast"—surely a very gentle structure to such a nefarious proceeding

The price 9s net, seems high considering the size of the book but perhaps this is an advantage as it will help to keep it from falling into the hands of those who might read it for merely prurient reasons

## Preparations, &c.

(1) THE BRITISH MANUFACTURE OF INSULIN
(2) RIGHT METHOD IN PHOTOGRAPHY
(London Burroughs Wellcome and Co Snow Hill Buildings, London E C 1)

THE BRITISH MANUFACTURE OF INSULIN

**Insulin** is a pancreatic active principle discovered by workers in the University of Toronto and used in the treatment of diabetes mellitus The British patent

[illegible] Medical Research Council who have issued licences for [illegible] that medical [illegible] must, before issue, be [illegible] of the Council It is under this licence [illegible] Insulin is manufactured and issued by Burroughs Wellcome [illegible] of national and unique equipment and reputation in the field of [illegible] recognized

Wellcome [illegible] is a sterile, watery solution of a material obtained from fresh [illegible] fractionation It is issued in rubber capped phials containing [illegible] solution The dose is indicated in units and not in volume [illegible] being 10 units injected subcutaneously twice daily The present practice per dose of 10 units is 3s 6d

Each unit injected is calculated to enable the patient to take at the ensuing meal 1 to 1½ grm of additional carbohydrate or its equivalent without increasing sugar

With medical approval of Wellcome Brand Insulin Burroughs Wellcome and Co issue a pamphlet prepared under the direction of the Medical Research Council and containing authoritative particulars as to the mode of administration type of case for which Insulin is suitable dosage &c. Copies of this pamphlet will be sent gratis and post free to any medical practitioner who applies to Burroughs Wellcome and Co

Owing to the present scarcity of supplies the Medical Research Council point out that treatment should for a time at least be confined to severe cases of diabetes mellitus

A special warning is issued that there is as yet no clear evidence of a curative action Insulin enables the patient to metabolize a sufficient quantity of carbohydrate but there is no ground for assuming that it can bring about a resumption of the normal function For this reason its use is not to be recommended except as an emergency matter without a clear prospect of continuing the administration for an indefinitely long period

An emphatic warning is issued that Insulin is of service only in true diabetes mellitus and is definitely dangerous in the so called renal glycosuria or diabetes innocuous The British Research Council state that administration by the alimentary canal has no demonstrable effect, and that preparations of the pancreas recommended for administration by the mouth whatever their effects may be, have not the action of Insulin

## Right Method in Photography

**Right Method in Photography** is the latest booklet issued gratis to photographers by Burroughs Wellcome and Co The title is an apt description of its contents which embody a delightfully simple and scientifically accurate review of the essentials of successful photography The publication is of real value to beginner and advanced worker alike the information being eminently practical and based upon long experience and extensive original researches

Most photographers to day realize that development is a chemical reaction the speed of which depends upon the composition and temperature of the solution and the character of the plate or film employed Successful work therefore is rendered more certain by standardized development and the time tables compiled by Burroughs Wellcome and Co form an admirable guide to this end

"Right Method in Photography" is well illustrated The cover is a reproduction in photogravure of the Base Camp of the Mount Everest Expedition 1922 situated on the Rongbuk Glacier at an altitude of 17 000 feet A photograph of historic interest is reproduced on page 19 which shows the official photographer to the expedition Captain Noel, at work outside his dark room tent

Those of our readers who are photographers should not miss this booklet It may be obtained gratis and post free on application to Burroughs Wellcome and Co, Snow Hill Buildings, London E C 1

# News of the Service.

## BIRTH

[illegible] 21 [illegible] The Grange, Alverstoke, Hants [illegible] Hodson R.N. a daughter.

## OBITUARY

[illegible] H.S. M.D. R.N. retired [illegible] has 8 [illegible] He joined the Royal Navy [illegible] as M.H.S. Mathews, and [illegible] 1856. In March 1857 he was [illegible] the China War (1857–8) and [illegible] was appointed [illegible] 1860 he joined the [illegible] Prince [illegible] August 18[illegible] under Sir [illegible] Commander [illegible] 1870) [illegible] 1880) [illegible] to Flag Staff [illegible] the Medical Department [illegible] the Bay [illegible] 1890 [illegible] high [illegible] the [illegible] of M.[illegible] 1881 [illegible] Physician [illegible] Medical [illegible] Navy [illegible] Medical [illegible] which [illegible] Sir Robert Hill, Medical [illegible] of the Navy [illegible] and Naval Medical Service.

[illegible] John Steggmann, R.N.V.R. [illegible] a Leeds [illegible] was a severe operation which [illegible] M.B. [illegible] University of Dublin [illegible] R.C.P. [illegible] He was also a Barrister at Law [illegible] to public health. He was [illegible] and examiner in the National [illegible] and [illegible] at Lockwell near Hounslow [illegible] Stegmann [illegible] Stall Street [illegible] (retired to 1919) and Burg on Coun[illegible] valuable. [illegible] appointed to H.M.S. *Sir Francis Drake* [illegible] in 1916. He was [illegible] *Drake* died in 1917. He specialized [illegible] Vice-Admiral Dakas, W.C.M. [illegible] gone into the practice of [illegible] Sick Leave which was conferring [illegible] mortality among parents and the

[illegible] His reports [illegible] on the [illegible] malaria on the West Coast of Africa [illegible] On return from [illegible] appointment in [illegible] naval ports. It was [illegible] Perhaps very largely [illegible] the approval of the [illegible] Medical [illegible] General [illegible] and brought [illegible] At [illegible] National [illegible] health [illegible] deeply [illegible]

He [illegible] D.N.M. [illegible] Decorat[illegible] advice [illegible]

The [illegible] which Sur[illegible] R.N. [illegible] presented the Medical [illegible] General of [illegible]

## HONOURS AWARDED

The [illegible] graciously pleased to appoint Surgeon Vice-Admiral Sir [illegible] K.C.B. [illegible] Medical Director-General, an Honorary Surgeon [illegible] the vacancy [illegible] death of the late Inspector-General [illegible] H. Lloyd [illegible]

The [illegible] pleased on the occasion of His Majesty's [illegible] orders [illegible] the Most Honourable Order of the Bath:

To be [illegible] Military Division of the Third Class or [illegible] Most Honourable [illegible]

Surgeon [illegible] Chambers, C.M.G., M.B., B.A.

At [illegible] the Royal College of Surgeons [illegible] second [illegible] Anthony Bowlby, K.C.B., K.C.M.G., K.C.V.O. [illegible] Chair [illegible] Vice-Admiral Sir [illegible] Hall [illegible] C.V.O. [illegible] the Navy [illegible] standing.

Surgeon Commander [illegible] O.B.E., M.D., D.P.H., D.T.M. [illegible] Naval [illegible] Medical Officers of Health for his paper [illegible] which was [illegible] Apr [illegible] Naval Medical [illegible]

The [illegible] awarded by Dr. J. F. Nash [illegible] the best paper [illegible] Branch of the Society of Medical Officers of Health.

## DEGREES AND DIPLOMAS

Surgeon Commander W. G. Edwards was successful in obtaining the degree of M.D. Durham [illegible] Examination held in March.

Surgeon Lieutenant-Commander A. F. Mileson was successful in obtaining the Diploma in Public Health as the result of the Examination held at Queen's University, Belfast, during March.

Surgeon Lieutenant-Commander [illegible] S. Coodhall, M.A., D.P.H., passed the examination [illegible] April [illegible] proceed to the degree of Doctor of Medicine of the University of Cambridge.

Surgeon Commander R. W. G. Stewart, O.B.E., M.B., and Surgeon Commander [illegible] Rattray, M.B., [illegible] passed [illegible] Examination [illegible] Conjoint [illegible] England.

Surgeon Commander W. [illegible] was successful in passing [illegible] examination held in April for the Diploma in Medical Radiology and Electrology [illegible] of Cambridge.

Surgeon Captain S. H. Wood, M.D., B.A., Ret., passed the Final Fellowship Examination of the Royal College of Surgeons of England on June 7.

Surgeon Commander [illegible] F. Stiles passed the Final Fellowship Examination of the Royal College of Surgeons of England on June 8.

## EXAMINATION FOR PROMOTION

The following gentlemen, in alphabetical order, were successful in passing the examination to be promoted to Surgeon Commander at the end of the five months' course of instruction which commenced on September 29, 1922:—

Surgeon Lieutenant-Commander R. A. Brown, M.B.
C. D. Bromfield, O.B.E., M.B.
R. W. Carruthers.
H. W. E. Davy Williams, M.B.
R. A. W. Ford.
J. Hinks.
J. I. Triston, M.B., M.R.C.P., D.P.H.
A. C. Stirling, M.B.
R. K. Stone, M.C., M.B.
I. R. Wilkinson, O.B.E.

Surgeon Lieutenant-Commander J. L. Triston, in obtaining over 75 per cent. of the available marks, was the only examinee who passed in one year's accelerated promotion.

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## PROMOTIONS

Surgeon Captain John Ellacott Hall, C.M.G., was promoted to Surgeon Rear-Admiral as from April 28, 1923.

Surgeon Lieutenant-Commanders Leonard A. Manson-Bahr, M.B., Adrian C. Paterson, Henry E. Seager Hall and Thomas Orkney were promoted to Surgeon Commanders as from May 19, 1923.

Surgeon Lieutenant-Commander Ernest E. Rampling was promoted to Surgeon Lieutenant-Commander as from April 28, 1923.

Surgeon Lieutenant-Commander Harold H. Douglas was promoted to Surgeon Lieutenant-Commander as from April 28, 1923.

Surgeon Lieutenant-Commander John F. Wyle, M.B., was promoted to Surgeon Lieutenant-Commander as from April 28, 1923.

Surgeon Lieutenant-Commander S. M. Grieb, M.B., was promoted to Surgeon Lieutenant-Commander as from May 1, 1923.

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## NAVAL MEDICAL COMPASSIONATE FUND

At the Quarterly Meeting of the Director of the Fund held on April 17, seven cases were considered and £100 voted to the applicants. The following is a summary of the cases:—

Daughter, aged 71, of a deputy inspector general who died in 1904. Income derived from Scottish pension £40 and interest on investments. Applied for assistance on account of heavy expenses. Voted £15.

Daughter, aged 50, of fleet surgeon in Royal Navy, who died in 1883. Applied for assistance on the ground that her nursing support was very small and required help to meet the high cost of living. Voted £10.

Daughter, aged [illegible], of surgeon in Royal Navy, who died in 1862. Has no relatives except half-sister; this is her present circumstances. Is in receipt of grants from Lloyd's Patriotic and the Naval Compassionate Funds. Voted £20.

Daughter, aged 41, of a Deputy inspector general in Royal Navy, who died in 1899. Income derived from a trust fund and at present is unable to earn anything owing to general debility due to overwork (attested by medical certificate). Voted £15.

Daughter, aged 17, of a fleet surgeon in Royal Navy, who died in 1899. Her health since 1917 has been very indifferent due to shock the vessel in which she was returning from India in a torpedo. Income derived from interest on subvention £20 and assistance from the Fund. Previously sent her help in addition. Applied for assistance towards living expenses. Voted £10.

Daughter, aged 65, of a deputy inspector general, who died in 1904. Income derived from a Scottish pension £20 and interest on investments. At date of application was suffering from a nervous breakdown (attested by medical certificate). Voted £20.

Widow, aged [illegible], of a deputy inspector general, who died in 1900. In great distress owing to the high cost of living, &c. Only her pension to live on. Voted £10.

Medical Officers on the Active List of the Royal Navy, who have not yet subscribed, are invited to do so on annual subscription of one guinea. Subscriptions should be sent to the Honorary Secretary, Naval Medical Compassionate Fund, Medical Department of the Navy, Admiralty, S.W.1.

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## NAVAL MEDICAL COMPASSIONATE FUND

### Account of Receipts and Payments for year ending December 31, 1922

| | £ | s | d | £ | s | d |
|---|---|---|---|---|---|---|
| Balance at Bank on January 1, 1922 | | | | | | |
| Deposit Account | 600 | 0 | 0 | | | |
| Current Account | 195 | 3 | 8 | | | |
| | | | | 795 | 3 | 8 |
| Dividends on Consols | 248 | 8 | 8 | | | |
| Interest on War Stock | 35 | 0 | 0 | | | |
| Interest on Conversion Loan Stock | 11 | 16 | 3 | | | |
| | | | | 295 | 5 | 0 |
| Interest on Deposit Account | | | | 6 | 11 | 10 |
| Donations | | | | 1 | 1 | 1 |
| Subscriptions | | | | 99 | 15 | 0 |
| Refund from Administrator of the estate of a late recipient | | | | 15 | 0 | 0 |
| | | | | £1,213 | 16 | 6 |

| | £ | s | d |
|---|---|---|---|
| Awards to Orphans and Widows | 60 | 0 | 0 |
| Secretary's Allowance | 29 | 0 | 1 |
| Auditor's Fee | 2 | 2 | 0 |
| Messenger's Allowance | 1 | 11 | 0 |
| Cheque Book | 0 | 8 | 11 |
| Stationery | 0 | 1 | 11 |
| Postal and Incidental | 0 | 9 | 0 |
| Donation to the Guardians of St. Giles' Cripplegate (re a special case) | 1 | 0 | 0 |
| Purchase of £900 3½ per cent. Conversion Loan | 681 | 5 | 0 |
| Balance at Bank of December 31, 1922 | | | |
| Deposit Account 1,283 16 9 | | | |
| Current Account *Nil* | | | |
| | 283 | 11 | 9 |
| | £1,213 | 16 | 6 |

I certify that the above Cash Account and Balance Sheet is a true and correct statement of all receipts and payments for the year ended December 31, 1922, and that the Bank balance of £283 11s. 9d. includes £10 10s. 0d. being the amount of Donations received and awaiting disbursement.

The Stock Exchange Quotations of the Stock held by the Bank of England in the name of the Trustees on December 31, 1922, are as stated.

Subscriptions to the amount of £16 11s. are due and owing.

(Sd.) A. DIGGINS
*Accountant-General of the Navy*
*Auditor*
*January, 1923.*

Details of the above Cash Balance and Stocks to the following amounts were standing at the close of the accounts at the Bank of England, in the name of the Trustees:—

| | | |
|---|---|---|
| | £16,600 | 2½ per cent. Consols |
| + | £300 | 4 per cent. War Loan Stock, 1929–1947 |
| | 400 | 5 per cent. National War Bond, 1927 |
| | £900 | 3½ per cent. Conversion Issue Bond Stock |

(Sd.) F. SUTTON, *Surgeon Captain R.N.*
*Hon. Treasurer.*

## ROYAL NAVY MEDICAL CLUB

[illegible] Royal Naval Medical Club held at the [illegible] successful which has taken place [illegible] inaugurated.

[illegible] those who attended [illegible] the medical officers of the Royal Navy [illegible]

[illegible] was 110, which is the largest gathering [illegible] attained.

[illegible] reception was held [illegible] Russell [illegible] presiding [illegible] the past [illegible]

[illegible] Surgeon Vice-Admiral Sir Robert Hill [illegible] occupying the [illegible] he fulfilled his duties [illegible] to a very great degree [illegible] the success of the [illegible]

[illegible] Lieutenant-General Sir John Goodwin [illegible] C.M.G. [illegible] Medical Service) and Colonel Sir James Clark, Bart. [illegible] Humphry Rolleston [illegible] William [illegible]

[illegible] the same toast [illegible] Navy to have been invaluable [illegible] August 1914 when [illegible] Fleet [illegible]

[illegible] all tables [illegible] the greatest [illegible] success and general organization [illegible]

[illegible] the company was subsequently [illegible] Club [illegible] the Hon. Secretary [illegible] the great success of the [illegible]

[illegible] in addition to the following members of [illegible] Surgeon Rear-Admiral W. G. [illegible] Surgeon Captain [illegible] Surgeon Commander C. R. [illegible] Campbell, O.B.E., Surgeon [illegible] Surgeon Commander C. C. [illegible] Surgeon [illegible] O.B.E., Surgeon [illegible] Surgeon Captain [illegible] W. B. Hall, Surgeon [illegible] Surgeon Commander [illegible] Holmes [illegible] Surgeon Commander [illegible] Surgeon Captain [illegible] Surgeon Lieutenant [illegible] Clifford [illegible] Surgeon Commander [illegible] Surgeon Rear-Admiral [illegible] Surgeon Commander [illegible]

[illegible]

## MEMORIAL TO THE PORTSMOUTH SICK BERTH AND AUXILIARY SICK BERTH RATINGS OF THE ROYAL NAVY

UNVEILED AT HASLAR

[illegible]

# THE NAVAL MEDICAL MEMORIAL FUND

## Statement of Receipts and Expenditure, January, 1920—May, 1923.

### Receipts

| | £ | s | d |
|---|---|---|---|
| By Interest [illegible] Account | 29 | 12 | 11 |
| Refund [illegible] Newspapers of Amounts charged in Excess [illegible] for Announcements | 0 | 17 | 6 |
| Donations [illegible] Fund | 785 | 12 | 6 |
| Transferred from Deposit Account to Current Account | 600 | 0 | 0 |
| | 1,416 | 2 | 11 |

I have examined the above Account with the books and vouchers [illegible] and find all the information and explanations that I [illegible] and

I certify as the result of my audit that the above Account is [illegible]

(Sd.) W. W. TOTTINGHAM
*Principal Auditor, Navy Department*
*May 10, 1923.*

### Payments

| | £ | s | d |
|---|---|---|---|
| Transferred to Fixed Deposit Account | [illegible] | [illegible] | [illegible] |
| Cheque Book | [illegible] | [illegible] | [illegible] |
| Printing 2,500 and 450 Circular Letters applying [illegible] Envelopes for same, printing Special Instructions [illegible] and supplying Envelopes in same | [illegible] | [illegible] | [illegible] |
| Postage Stamps and General Stationery | [illegible] | [illegible] | [illegible] |
| Refund through Bank of Subscriptions intended for the Naval Medical Compassionate Fund | 1 | 1 | [illegible] |
| Local Expenses incurred at Halifax Unveiling Ceremony | 2 | 5 | [illegible] |
| Plymouth | | 11 | [illegible] |
| Cost of preparing Blocks for Illustration of Accounts of the several Unveiling Ceremonies | 1 | [illegible] | [illegible] |
| Clerical Assistance 1920 to 1922 inclusive | 1 | 1 | 0 |
| Announcements in Newspapers | 3 | 1 | [illegible] |
| Settlement of Account for the Making and Fresh [illegible] the Three Gun metal Mortar Tablets one of which was erected at each of the three Principal Naval Hospitals (Portsmouth, Plymouth and Chatham) | 43 | 1 | 6 |
| Refund to Plymouth Sick Berth Staff of Share of the Unexpended Balance of the General Fund | 1 | 10 | 0 |
| Donation to the Naval Medical Compassionate Fund of the remaining Unexpended Balance | 35 | 1 | 8 |
| Honorarium to Auditor | | 2 | 0 |
| | £1,416 | 2 | 11 |

(Sd.) C. B. BUSHI
*Surgeon Commander, R.N.*
*Hon. Secretary.*

*May 4, 1923.*

[illegible] on the Rev. C. Graham, O.B.E., the [illegible] attendance [illegible] proceeds adjoining the quarters of the Sick [illegible] bearing a laurel wreath and the inscription

[illegible] 1923

[illegible] Staff [illegible] of [illegible]

At the [illegible] were included at the left of the memorial [illegible] Medical Officers and Sisters, the Sick Berth Staff and No. 5 Mess.

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## AWARD OF SICK BERTH EFFICIENCY GOLD MEDAL

The Sick Berth Efficiency Gold Medal for 1922 has been awarded to Sick Berth Petty Officer John Troop, Forest, O.N. 251237. This gold medal is given annually to a member of the Sick Berth Staff of the Royal Navy who, in the opinion of his medical officers, has most distinguished himself by the exhibition of zeal and efficiency in the discharge of his duties during the preceding year. The medal has its origin in the generosity of a retired naval medical officer (who desires to remain anonymous) who gave the sum of £100 to provide for its annual award.

The presentation took place at the Royal Naval Hospital, Chatham, on Friday, May 25, 1923, when Surgeon Rear-Admiral C. Marsh Underhill handed the medal to Sick Berth Petty Officer Forest and warmly congratulated the recipient on his well merited honour.

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## ADMIRALTY ORDERS ISSUED FROM MARCH 15, 1923, TO JUNE 15, 1923

(Only the more important Orders pertaining directly to the duties of the Medical Officer attached are considered here included.)

### *656.—Washing Linen for the Sick Bay—Payments to Naval Ratings

(N.P. (M.) 827/2.—10/5/1923.)

[illegible] is authorised from the date hereof the maximum rates which may be paid to Naval ratings employed in washing articles of Sick Bay Linen are to remain as at present viz.:—

| | s. | d. |
|---|---|---|
| Tablecloths | 1 | 9 per dozen |
| Sheets | 1 | 9 |
| Pillow Cases | | 10 |
| Bed Covers | 1 | 3 |
| Towels | | 10 |
| Coverlets | 1 | 6 |
| Blankets | 5 | 3 |

(2) The work should however be performed in contract or there or in the ship's laundry wherever practicable.

(3) In exceptional circumstances where the Commanding Officer is satisfied that the foregoing rates do not sufficiently compensate the ratings during regard to the labour involved and the cost of the materials used he may authorise payment of such higher rates as he considers fair and reasonable. In every such case an explanation is to be appended to the relative voucher in the Cash Account.

(A.F.W. 2275/22 is cancelled.)

(This Order will be referred for posting on Notice Board.)

### 826.—Betulinum Antitoxin Serum

(M.D.G. 8553/22.—30/5/1923.)

Arrangements with Messrs. Burroughs Wellcome & Co. have been made whereby Betulinum Antitoxin Serum when required will be supplied direct to Ships and Establishments by that firm on receipt of a demand from the Medical Officer in charge.

The Serum is put up in phials containing 10 c.c. and when ordering the amount required must always be specified.

Demands made by telegram or telephone are to be confirmed subsequently by letter in which the reference C.F. 982/23 must be quoted.

[illegible] the Wellcome & Co address is Snow Hill Buildings London E C 1 [illegible] Telegrams Tabloid Cent London. Cables and Wire [illegible] lon

**591 —Medical History Sheets.**
(M D G Sec 23 —19 4 1923 )

[illegible] History Sheets are at present being used to an extent that appears to be [illegible] close supervision is to be exercised in connection with the custody and [illegible] important documents

[illegible] History Sheets are only to be made use of when every effort has been [illegible] Medical History Sheet without result

[illegible] all the information required by the headings of the Sheet as well as [illegible] be inserted in every case

(A F O 349/23 )

***1516 —Dental Hygiene**
(N 12623/22 —8 6 1923 )

[illegible] called to the importance of dental fitness in all men serving [illegible] the facilities provided for obtaining dental treatment (A F O 118/23)

[illegible] found in the Naval establishments for shown below and arrange [illegible] paragraph 3) for treatment of Naval personnel where no Naval [illegible] Army and Air Force dental centres and be civilian dental surgeons

[illegible] ESTABLISHMENTS IN WHICH DENTAL OFFICERS ARE BORNE

[illegible] Chatham Devonport

[illegible] Chatham Plymouth Portland South Queensferry

[illegible] Shotley *Impregnable* and *Fisgard*

[illegible] Naval Barracks

[illegible] *Repulse Repulse* and *Dunbow*

[illegible] dental treatment should be directed towards the preservation [illegible] of children's teeth should be extracted When sending [illegible] Officers for treatment the Naval Medical Officer is before [illegible] that it is necessary

[illegible] teeth and maintain a high standard of dental health [illegible] Hygiene institution given in patients attending for [illegible] Hygiene These lectures may be illustrated by [illegible] at the establishment where the Dental

[illegible] and (Form S 135a) from the Lantern Lecture [illegible] special slides will be prepared from suitable illustra

[illegible] Naval Depôts the lectures should be given monthly as far [illegible] dentists All new entries should be required [illegible] attendance at other times should be obtain [illegible] should be given at frequent intervals provided amt [illegible] on Sundays assured

[illegible] through the Commanding Officer of the [illegible]

[illegible] dental treatment attention is called to the [illegible] from a disease attributable to the bad condition of [illegible] negligence or want of proper care on his part may [illegible] liable at the discretion of the Admiralty to be [illegible]

(A F O 118/23)
[illegible] 2/5/23 cancelled)
([illegible] 133/m)

(The [illegible] recommended for publishing on Notice Board )

*Face last matter*

# Notices

The Editors invite Medical Officers to send in Original Papers on professional subjects, travel personal experiences, &c. Items of matters of interest to the Naval Medical Service will be welcomed, ships and establishments on home and foreign stations.

All Articles or Communications published in the JOURNAL OF THE ROYAL NAVAL MEDICAL SERVICE will become the property of the Journal with full copyright powers, unless the author declares when sending the Article that he desires to reserve the copyright to himself.

Notices of Births, Marriages and Deaths are inserted free of charge to subscribers.

**All Communications should reach the Editors on or before the 1st of the month preceding the date of issue.** Unless clearly written, they should be typed in order to avoid mistakes, and they should be addressed to the Editors, JOURNAL OF THE ROYAL NAVAL MEDICAL SERVICE, Medical Department, Admiralty, London.

The JOURNAL OF THE ROYAL NAVAL MEDICAL SERVICE is published quarterly, four numbers comprising one volume.

The Subscription is 20s. per annum (postage included), payable on January 1 of each year, but should a subscriber wish to commence at another quarter he may do so by payment at the rate of 5s. per copy. All subscriptions are payable in advance. Single copies can be obtained at 6d. per copy. Cheques or Postal Orders for Subscriptions should be crossed "Lloyd's Bank, Ltd.", and be made payable to the Manager, JOURNAL OF THE ROYAL NAVAL MEDICAL SERVICE, Medical Department, Admiralty, London, to whom all communications relating to subscriptions, &c., should be addressed.

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Journal
of the
Royal Naval Medical Service.

## Original Articles.

### A HISTORY OF THE ROYAL NAVAL AUXILIARY SICK BERTH RESERVE

By Surgeon Commander G. G. M. DICKENSON, M.B., R.N.

In the pre-war days, naval medical officers serving in hospitals and reserve fleet ships were accustomed to the periodical appearance of members of the St. John Ambulance Brigade in the wards and sick bays, but beyond a vague notion that they were up for training, the majority knew very little of the organization of the Sick Berth Reserve. In the early days of the war the St. John Ambulance Brigade uniform was again in evidence and the large numbers of the Brigade then seen must have been a revelation to those accustomed only to the small numbers met with when up for training. Later in the war the Brigade uniform disappeared entirely from the Service. The men however had not disappeared, they had merely exchanged the black and white uniform of the Brigade for the navy uniform of the sick berth staff with the letters S.B.R. below the arm badge.

Many medical officers retain very pleasant memories of the assistance rendered by these reservists both afloat and ashore and of their zeal and smartness and the way they picked up the work. It has therefore been considered that a history of the Royal Naval Auxiliary Sick Berth Reserve would be of interest to readers of this Journal.

The question of a reserve of male nurses appears to have been first raised in 1894, when Sir James Dick was Medical Director General and in 1898 Sir Henry Norbury estimated that 90 to 100 temporary male nurses would be required to replace the sick berth ratings sent to ships from the naval hospitals. The various proposals apparently went no further

[illegible] in the preparation of bills stating the terms of pay &c the idea being [illegible] all for [illegible] from any source in times of emergency In 1900 it [illegible] estimated that in case of war, there would be a shortage of about [illegible] sick berth [illegible] and it was then proposed to enter St John Ambulance [illegible]

In [illegible] Inspector General H C Woods C B, C V O M D [illegible] was appointed to the Admiralty to frame a scheme for the institution of a sick berth reserve and presented his final report in December of that year He estimated that the shortage of staff in time of war would be 1 [illegible]3 according to the complements then allowed, but argued that larger complements were necessary in view of the casualties likely to occur in modern warfare On this basis he estimated that a reserve of 1 969 male nurses would be required on the outbreak of hostilities

The question of extending the Fleet Reserve to embrace the Sick Berth staff was found to be impracticable so it was decided to co operate with the St John Ambulance Brigade and the Ambulance Corps of St Andrew in Scotland Colonel C W B Bowdler Chief Commissioner of the Brigade in those days took up the scheme with enthusiasm and Inspector General Woods must have found his assistance of great value

It is to Inspector General Woods that the Royal Naval Auxiliary Sick Berth Reserve owes its institution and it is interesting to note that his original report draws attention to the necessity for the systematic instruction in first aid of certain ratings in H M ships and to the advisability of the senior medical officer of a flagship accompanying the admiral when carrying out his annual inspection

There were many points in favour of drawing these reserves from the St John Ambulance Brigade —

(*a*) It had a strength of nearly 10 000 men

(*b*) It was a highly organized body a matter of great importance from the point of view of mobilization

(*c*) The men were keen on their work

(*d*) They had to maintain their efficiency year by year

(*e*) They had numerous opportunities of putting their theoretical knowledge to a practical test

(*f*) They were accustomed to discipline

(*g*) In giving their services free at all large gatherings on the railways, in mines docks and streets it was evident that they were influenced by the idea of giving help to others

As the St John Ambulance Brigade plays such an important part in the organization of the Sick Berth Reserve, an account of the Order of St John and its various organizations will it is hoped be of interest[1]

[1] Extracted by permission from "The Grand Priory of the Order of the Hospital of St John of Jerusalem in England Some particulars of the above The Origin of the Order of the St John Ambulance Association by Sir John Furley C B and Six Months of St John V A H Monthly by Miss Theakla Bowser F J I

The [illegible] Order of Jerusalem took its origin at the [illegible] of the eleventh [illegible] were established for the relief of the [illegible] Pilgrims [illegible] It was about the year 1048 that certain merchants of [illegible] in Naples founded a hospital in Palestine probably on [illegible] Hospital which had existed for the use of these [illegible] who called themselves the Brothers of the Hospital of St John of Jerusalem and who devoted themselves solely to the care of the sick and wounded Later the Brotherhood formed itself into an Order of Military Monks undertaking as their special work the protection of pilgrims journeying to and from the Holy City

About this time were instituted other orders such as the Knights Templars founded about 1124 and the Teutonic Knights but these were purely military in character The first object of the Order of St John was succour and it was only after it had been founded for a good many years that it became a military Order

The Knights originally took for their emblem the white cross on a red ground Their robes were black with the eight pointed white cross and, in fighting they wore over their armour a tunic of red with a large plain white cross in the front After the loss of Rhodes the red robe was discarded and black was worn as a sign of mourning Since that time the colours of the Order have always been black and white

In 1291 the Christians were finally turned out of Palestine by the Saracens and the Order removed to Cyprus

In 1310 the Knights went to the Island of Rhodes, where they became very powerful from the military point of view They were attacked by the Turks but were victorious

In 1522 the Turks again attacked Rhodes and captured it, but they allowed the armorial bearings to remain on the buildings out of respect to the Knights of the Order There is still the famous 'Street of the Knights' where each Langue, or nation had its official house

When the Knights were turned out of Rhodes they wandered about Western Europe, trying to devise a means of recovering the island Eventually the Grand Master, De L'Isle Adam, came to England and was entertained in the Priory at Clerkenwell where in 1130 the English branch of the Order had been established and there in the beautiful old Council Room over the gate Henry VIII met him and gave him ninety in great cannon and over a thousand balls

In 1530 the Emperor Charles V of France, granted Malta to the Knights, In 1565 the Turks attacked and besieged the island, but were eventually defeated This siege became very famous in history because of the magnificent stand made by the Grand Master, Jean de la Valette, after whom the town of Valette is named

In 1798, Napoleon who was very jealous of the Knights of St John, and thought they were much too powerful a body to be really safe past envious eyes on Malta The French invaders took possession of the island and the Knights were once more scattered all over Europe

That is a brief history of the Knights abroad but the Order had its home in England from the year 1130 when a great priory was built in Clerkenwell The old Gatehouse which is the only part left of the Priory, was of course the gate to the many acres of land which the Priory covered It is difficult to realize that the new busy main thoroughfare called Clerkenwell Road runs straight through what were the quiet fields and pasture lands where once there dwelt the Brothers of the Order in their beautiful Priory house The Priory Church of St John which lies on the opposite side of Clerkenwell Road to the Gate stood well within the grounds and the fine old crypt and portions of the walls still exist

During the Wat Tyler Insurrection in 1381 the beautiful old Priory at

[illegible] It was [illegible] and the Gatehouse [illegible] who gave [illegible] purpose [illegible] in 1540 Henry [illegible] Priory [illegible] and forbade the [illegible] to [illegible] Knights were [illegible] Queen Mary, on [illegible] to return [illegible] were incorporated [illegible]

[illegible] English possessions [illegible] were again con[illegible] not actually dissolved [illegible] little is heard [illegible] revival in the year 1831 [illegible] Many that Queen Victoria based the one which she [illegible]

On [illegible] coronation of the excellent work performed by the [illegible] County during the past half century—especially the establishment [illegible] Ambulance Association which has done and is doing [illegible] invaluable work in the interests of humanity and the [illegible] British Ophthalmic Hospital at Jerusalem—Queen Victoria [illegible] a new Royal Charter of Incorporation by the old name [illegible] Grand Priory of the Order of the Hospital of St John of Jerusalem [illegible] England Her Majesty was graciously pleased to become the Sovereign Head and Patron of the Order

The various grades of the Order are as follows A Grand Prior, a Sub Prior, a Titular Bailiff of Egle Honorary Bailiffs Commanders Honorary Commanders Knights of Justice Ladies of Justice Prelates Sub Prelates, Chaplains Knights of Grace, Ladies of Grace Esquires, Serving Brothers and Sisters with whom are associated, but not as members Honorary Associates and Donats

The badge of members is an eight pointed or Maltese cross of white [illegible] enamelled alternately at each of the principal angles with a lion [illegible] and a unicorn, both passant, either of gold or silver, according to [illegible] It is worn suspended from a black watered silk riband.

It is very difficult to trace the origin of the St John Ambulance Association [illegible] seems to have been gradually evolved from the Red Cross movement [illegible] was becoming actively prominent during the "sixties The Order of St [illegible] of Jerusalem in England was represented at the International Conferences of [illegible] Societies in Berlin in 1869 and in 1870 many members of the Order [illegible] in the newly formed British National Aid Society and were [illegible] actively engaged both at home and abroad during the Franco German war

In 1875 it was definitely decided that no Red Cross Society could fulfil its [illegible] unless it were properly organized in time of peace

At the Annual General Meeting of the Order of St John held in 1874, a paper was read [illegible] Observations on the preliminary care and attention necessary for accidental bodily injuries and mutilations occurring in mines and establishments where many workpeople are employed This was the first occasion at St John's Gate on which broad lines were laid down by a competent authority on first aid to the injured

It was in 1877 that the St John Ambulance Association came into existence as a Department of the Order of St John but its management and finance were [illegible] independent The first centre was established at Woolwich quickly followed by a Metropolitan centre and the formation of centres at Sevenoaks Westerham Worcester Malvern and Southampton

In 1881 a great advance was made especially amongst the Derbyshire and [illegible] collieries The work was also taken up by the Metropolitan Police

and on one occasion in Scotland Yard where there was a difficulty about the time for police classes the men were asked by their officers whether they would prefer to forego first aid instruction or give up part of the dinner hour all the policemen who were present replied that they would rather sacrifice the recreation time

The course of instruction was usually limited to five lectures, followed by an examination and certificates were awarded to those who satisfied the examiner But although the doctors generally extended the lectures beyond the prescribed number, it soon became apparent that a large proportion of the pupils were not content with first aid lectures only, and therefore advanced classes were formed for women at St Mary s Hospital and for men at King s College and Westminster Hospitals Subsequently these advanced classes although not often held at hospitals, became general and a second examination was held and a superior certificate was given

It was in 1879 that the first manual of ambulance instruction (Shepherd s Handbook) was published, and 2 600 copies were at once sold

At this time also it was found necessary to establish a depot at St John s Gate, from which all articles required for the lectures, such as handbooks, anatomical diagrams, bandages, splints, tourniquets, and stretchers could be supplied

Hitherto the Association had obtained its two wheeled litters from Germany, and some of its stretchers from France; an ambulance wagon had also been purchased by special permission from the Royal Arsenal at Woolwich Nor must the Esmarch triangular bandage also made in Germany, be forgotten as it was then the most popular article of an ambulance s kit But it was now felt that the time had arrived when improvements might be adopted and a *material* invented for and adapted to the needs of the Association and manufactured in England A new stretcher was introduced, and this was soon followed by a two wheeled litter of original design, which combined the stretcher with an under carriage

In 1883 an effort was made to bring home first aid instruction to the officers and men of the mercantile marine more particularly to those on vessels which go to sea without a doctor More than twenty years afterwards a regulation was issued by the Marine Department of the Board of Trade making the possession of a first aid certificate by officers of the mercantile marine compulsory before promotion to certain grades

Since those days the scope and dimensions of the Association have grown enormously In practically every town throughout the kingdom there are organized centres for instruction and 1 020 313 certificates of proficiency in first aid and in home nursing have been issued

In order to facilitate the administration of first aid to the injured and to organize the volunteers qualified to perform this duty the St John Ambulance Brigade was gradually evolved It was felt that it was a great waste for all these thousands of men and women who had taken certificates in First aid and Home Nursing never to have an opportunity of using their knowledge for public benefit and gradually there grew up the idea of forming them into a corporate body

Ambulance stations were established at public exhibitions and at other places where large crowds were likely to assemble The most important of these early stations was at the Colonial and Indian Exhibition in 1886 and it was in the following year that these scattered corps were incorporated in the St John Ambulance Brigade

An ambulance corps from St John s Gate had been employed several times in

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[1] The well known Furley stretcher

the M[illegible] [illegible] olitan [illegible] an and [illegible] d encouraged [illegible] Ma[illegible] to dim[illegible] the [illegible] le several [illegible] olintors but [illegible] that time [illegible] e authorities [illegible] ble [illegible]

[illegible] d to [illegible] the [illegible] [illegible] were [illegible] of the [illegible] year [illegible] St John [illegible] Sisters were employed [illegible] George [illegible] day upwards of 1,500 [illegible] St John [illegible] volunteers

[illegible] the [illegible] of the Brigade in the metropolis only, [illegible] ly [illegible] ers on the [illegible] tensions mentioned below [illegible] Brigade to the civil population

| | No of cases treated |
|---|---|
| [illegible] [illegible] lee | Over 600 |
| [illegible] Victoria | 1 905 |
| [illegible] Edward VII | 1 375 |
| [illegible] King Edward VII | 1 100 |
| [illegible] Edward VII | Over 10 000 |
| [illegible] King George V | 1 534 |
| [illegible] Through London | Over 7 000 |

[illegible] the Brigade attended 160 000 cases of accident [illegible] Brigade is organized by districts of which [illegible] United Kingdom [illegible] Headquarters are at St Johns Gate Clerkenwell [illegible] Brigade at the present time are —

Chief [illegible] Colonel Sir James R A Clark, Bart, C B C M G [illegible]

Deputy Chief Commissioner Colonel G A Moore C M G D S O M D

Surgeon [illegible] Sir William H Bennett K C V O F R C S

Lady Superintendent of Nursing Corps and Divisions Lady Perrott R R C

Assistant Surgeon Chief Colonel S M Smith C B, F R C S

Secretary Mr [illegible] Harold Smith C B E

In each district the chief is a commissioner, with one or more assistant commissioners under him

Each district is divided into divisions, with a superintendent in charge In towns possessing three or more divisions these may be amalgamated into a Corps with a corps superintendent in charge

Each division raises its own funds which are administered by a committee of the division and a treasurer appointed Not only do the members of the Brigade render voluntary assistance to the general public in cases of accidents but they spend time and energy in raising funds—by means of concerts bazaars and collections—to carry out their work

[illegible]

| | |
|---|---|
| Chief Commissioner | [illegible] Corps Officer |
| Deputy Chief Commissioner | [illegible] Surgeon |
| Surgeon in Chief | [illegible] Superintendent |
| Lady Superintendent in Chief | [illegible] Divisional Superintendent |
| Assistant Surgeon-in-Chief | [illegible] Officer |
| Commissioner | [illegible] Officer |
| Assistant Commissioner | [illegible] Officer |
| District Surgeon | [illegible] Ambulance Officer |
| District Officer | District Sergeant-Major |
| Lady District Superintendent | Corps Sergeant-Major |
| Lady District Officer | Staff-Sergeant |
| County Surgeon | Sergeant |
| Corps Surgeon | Corporal |
| Corps Superintendent | Private |
| Lady Corps Superintendent | Ambulance Sister |
| Corps Officer | |

It will be seen that the Brigade is organized on military lines and the members are accustomed to the usual drills and to marching in companies, &c.

The uniform of the Brigade is dark with white metal buttons the peaked cap has a white band with the Brigade badge in front. Officers wear a jacket with white collar and black tie and a black leather Sam Browne belt. The men wear tunics with white gloves and a brown leather belt with pouch. Over the right shoulder is slung a white canvas haversack and over the left shoulder is worn a belt.

Members of the Prince of Wales District (London) wear as a collar badge His Royal Highness's plume of feathers.

Various badges are worn on the arm as indicating efficient service for periods of three years and special participation such as the Passes for the Association's medallion or certificate.

In addition to the Brigade medals officers and men proudly display medals and decorations gained during the South African War and in the Great War. Medals were also issued to those on duty during the Diamond Jubilee celebrations and at the coronations of King Edward VII and King George V. The R.N.A.S.B.K. Long Service Medal—awarded for twelve years service in this Reserve—is now by no means uncommon.

A parade of a large Corps of the St. John Ambulance Brigade makes a gallant show, and is second to none for a display of smartness, keenness, efficiency and of service.

Each division has its own headquarters, which may be a well equipped drill hall with billiard room, canteen and rooms, or one attached or merely a single small room on the top floor of some building. It appears as if

much depended [illegible] the local subscriptions and the generosity of the large employers [illegible]

Such, then, is the organisation from which the Royal Naval Auxiliary Sick Berth Reserve is recruited

Before this Reserve was instituted, the St John Ambulance Brigade had already gained experience in providing trained men to augment the Army Nursing Service in time of war In 1898, it being considered that the Brigade might be able to render valuable assistance to the Military Authorities in the event of a national emergency, negotiations were opened with the War Office with a view to some arrangements being made regarding the conditions under which members of the Brigade could be employed with the Army

In February 1899 a letter was addressed to the Secretary of State for War from the Chief Commissioner suggesting that it would be advisable [illegible] in time of peace the conditions under which, in time of war, the Brigade could be employed, and negotiations were opened with this end in view The Commissioner in the meantime called for a report to be sent [illegible] as to the feelings of all Corps and Divisions in the matter and [illegible] for a return of volunteers for service in South Africa

The first call for volunteers was made on November 21, 1899 and from [illegible] as the resources of the Royal Army Medical Corps became more [illegible] exhausted continuous calls were made on the Brigade These [illegible] without any hesitation or delay

Over 2 000 members of the Brigade served with the R A M C in the South African War a remarkable number considering that the total strength of the Brigade at the end of 1901 was only 6 500

The following is a little illustration of the rapidity with which these [illegible] were filled up An order for the second contingent of fifty five men was received at headquarters on the morning of November 20 and before midnight of November 22 these men, drawn from all parts of the kingdom were assembled at St John's Gate, fitted with clothing and fully equipped, although they did not embark until the 25th

Sixty two members of the Brigade lost their lives in that war eight were mentioned in despatches as having rendered special and meritorious service, and one private was awarded the Medal for Distinguished Conduct in the field

We can now return to the origin of the Royal Naval Auxiliary Sick Berth Reserve

In Inspector General Wood's original scheme it was proposed —

(1) To form a reserve of trained sisters for service in hospitals on shore [illegible]

(2) To extend the terms of the Royal Fleet Reserve to the Sick Berth Staff and thus slowly to build up a trained nucleus

(3) To supplement this by an Ambulance Reserve of Volunteers from the St John Ambulance Brigade and St Andrew's Corps and then [illegible] and

[illegible] the special courses of instruction at the Government expense to [illegible] as far as possible efficient for service

All [illegible] were accepted, except (b)

Within [illegible] the Ambulance Reserve it was proposed to have two classes—Junior and Senior Reserve Attendants the latter being those who passed an examination in Advanced First aid and Home Nursing—and the total complement to be approximately 2 000

The scheme received the sanction of H M Treasury in September, 1902 and the Order in Council authorizing the institution of the "Auxiliary Royal Naval Sick Berth Reserve" is dated November 19 1902. Inspector-General Woods was appointed organizing Medical Officer

The following is a brief summary of the regulations then formulated —

(1) After enrolment the reservist might attend an advanced course in first aid and nursing the expenses of which were borne by the Admiralty.

(2) Reservists who passed through the course were permitted to undergo a course of training at a naval hospital or sick quarters or at a civil hospital, or in a ship of war During this training they were paid 2s 6d a day

The sick berth steward giving this instruction was entitled to a fee of 2s 6d for each reservist

(3) Reservists were to be inspected annually

(4) When called out on mobilization, the reservists were to receive pay as follows —

Senior reserve attendants, 3s 9d a day

Junior reserve attendants, 3s a day

These rates of pay were to be increased by 6d a day after six months service and each reservist employed in a ship of war was to receive extra pay at the rate of 1s a day

In addition to pay as above, reservists were entitled to —

Provisions fuel and light in kind or an allowance of 1s 6d a day

Quarters or an allowance of 1s a day

A free kit if employed in a hospital ship or man of war

A free kit or an allowance of £2 10s in lieu if employed in a house or foreign hospital

Bed and bedding (on loan), or an allowance of £1 in lieu, if employed in ships or hospitals

Travelling and subsistence allowances

Pensions or gratuities for wounds or injuries on service

A gratuity of £5 on discharge

Pensions or allowances for widows and children of men killed drowned or dying from wounds or injuries received or diseases contracted, during warlike operations

The Order in Council clearly stated that the Reserve should be formed by the enrolment of men belonging to the St John Ambulance Brigade being a branch of the Ambulance Department of the Order of the Hospital of St John of Jerusalem in England, to St Andrew's Ambulance Associa-

[illegible] Associations [illegible]

[illegible] to serve on [illegible]

Class [illegible] war

Class [illegible] ships and non-fighting auxiliary ships temporarily [illegible]

Class C.—Hospitals medical establishments or harbour ships of the Royal Navy and coast ambulance stations abroad

Class D.—Hospitals medical establishments or harbour ships of the Royal Navy and coast ambulance stations at home

Candidates had to be medically examined as to physical fitness, to be between the ages of 20 and 50, and to be entitled of exemplary character and temperate habits

These regulations were promulgated by the St John Ambulance Brigade on February 20 1903 as a Brigade Order in which the various details were very clearly explained

During the first year recruiting did not proceed as rapidly as was anticipated but as time went on the Reserve became more popular as is shown by the following table —

| Year | Number on the Roll |
|---|---|
| 1904 | 268 |
| 1905 | 373 |
| 1906 | 593 |
| 1907 | 679 |
| 1908 | 681 |
| 1909 | 697 |
| 1910 | 1 015 |

During 1904 16 obtained the Advanced First aid and Nursing Certificate 80 had training in hospitals and 28 in ships In 1908 there were [illegible] and 210 junior reserve attendants

In 1912 the Regulations were revised and it was under these revised regulations that the R N A S B. Reservists served during the late war [illegible] alterations were —

(a) All references to coast ambulance stations were omitted The idea [illegible] was to have trained ambulance men, accustomed to [illegible] at certain towns on the coast who would in time of [illegible] be mobilized from ships

(b) The age limit on entry was reduced to 18

(c) Hospital training was confined to naval hospitals In the original [illegible] training could be done at approved civil hospitals

(d) When called out the sum of £6 was to be allowed to each reservist [illegible] purchase a kit and keep it in good repair This kit included the St John Ambulance Brigade uniform

[illegible] went on steadily [illegible] [illegible] [illegible]

| | |
|---|---|
| [illegible] Home Hospitals Reserve | 11,3[illegible] |
| [illegible] (Auxiliary Force) | 1,429 |
| [illegible] Ambulance Brigade Hospital, Etaples | 168 |
| [illegible] at home | 170 |
| [illegible] hospitals abroad | 158 |
| [illegible] Joint Committee of the Order of St John and the British Red Cross Society in France | 323 |
| | 16,646 |

[illegible] that over 20,000 men were supplied by the Brigade [illegible] during the first seventeen months of the war The above [illegible] include the large number of men belonging to the Brigade who [illegible] directly into the R.A.M.C without being enrolled in any reserve [illegible]

In addition [illegible] reservists enrolled from the St John Ambulance Brigade a scheme was [illegible] for the enrolment of first year medical students as members of the R.N.A.S.B.R The conditions of service, pay and allowances were [illegible] the same as for the other reservists As these men did not necessarily hold the St John Ambulance Association First Aid Certificate they were appointed to Chatham Hospital for a two months' course in first aid treatment, after which they were examined under the rules of the Association, which body granted their certificate to those who passed the examination

The first class was appointed to Chatham Hospital on November 29 1915, and 103 men in all were entered

| | | |
|---|---|---|
| First Class | November 29, 1915 | 26 Reservists |
| Second Class | February 7 1916 | 24 |
| Third Class | April 10 1916 | 23 |
| Fourth Class | July 3 1916 | 30 |
| | | 103 |

These men were, for administrative purposes enrolled in what was called the Royal Naval Emergency Division of the St John Ambulance Brigade and the majority were finally drafted to hospitals and hospital ships

The entry of medical students under these special conditions ceased after July 1916 as students then became of age for general military service A certain number of these already entered became Surgeon Probationers R.N.V.R

As the members of the R.N.A.S.B Reserve were drafted from the naval barracks it is impossible to trace their service with accuracy Many were immediately employed in the transport both by sea and land of the wounded from France although a scrutiny of their service certificates only shows that they were borne on the books of one of the depots

They were to be found in almost every ship in the naval hospitals at home and abroad in barracks, in auxiliary hospitals and in the Royal

Naval D[illegible]n Many f[illegible] can give them p[illegible] of the attempted defence [illegible] Antw[illegible]p and of them [illegible] retreat The R N A S B R was omnipresent

Those who had the opportunity of watching these men at work must have been struck by the rapidity with which the large majority picked up the details of the duties required of them. They were not the equal of our own efficient sick berth staff, but remember the difference in training.

A cotton weaver in Lancashire is ordered at 6 o clock one night to parade in his brigade uniform at the railway station next evening and to take a few clothes with him as he may be away from home a few months After a long weary journey he finds himself marched into a naval barracks where everything is in a state of orderly confusion Before he has had time to recover from his bewilderment he is packed off to a ship lying in the stream, and within a few hours finds himself at sea

The sea? Yes he knows the sea He usually spends his summer holiday at Blackpool

The sick and injured? Yes, he has a very good knowledge of the first-aid treatment of injuries and knows the elements of nursing But now he is dealing with the real thing and there are other matters to consider besides whether point 'A' goes over the left shoulder or under the right elbow

Poor John Smith—junior reserve attendant, R N A S B R!

Does not the following imaginary conversation appear likely to have taken place frequently in the sick bay in those early days?

*Sick Berth Steward* There s a man hurt in the stoke hold Smith, take a Robertson stretcher and some splints down while I tell the P M O

*Smith* 'Take a wheel?

*S B Std* 'Neil Robertson stretcher That thing there

*Smith* Where s the stoke hold?

*S B Std* "* * * *'

But what a difference after a year or so during which John Smith has been quietly using his shrewd North country brain His eyes and ears have not been idle, and by now he feels competent to run the sick bay on his own—provided someone else will do the dispensing!

A proof of the general competence of these men is the fact that so many were given the acting rating of 2nd sick berth steward although in those days, even a senior reserve attendant ranked only with a sick berth attendant

The reserve warrant masters, though very few in number were invaluable As officers of the Brigade their authority and their knowledge of drill were of great assistance where large parties of reservists had to be dealt with

Perhaps the most important factor in making these men feel at home in the Navy and thereby increasing their usefulness was the order that they were to be supplied with naval uniform in place of the Brigade uniform They had previously felt conspicuous in the black and white

[illegible] with [illegible] [illegible] finished by [illegible] staff [illegible] possible [illegible] account of the [illegible] but medical [illegible] agree that when [illegible] this work was [illegible]

[illegible] total [illegible] R N A S B reservists [illegible] demobilized until [illegible]

[illegible] reservists mobilized for the Navy not including [illegible] Royal Naval Division, was 3 024 These were mainly [illegible] —

| | |
|---|---|
| [illegible] on (Medical Unit) | 26 |
| [illegible] ' ment | 16 |
| [illegible] | 2 |
| [illegible] and discharged | 11 |
| [illegible] and discharged | 4 |
| [illegible] ember 31 1918 | 1 401 |
| [illegible] d after J [illegible] 1 1919 | 1,487 |
| [illegible] | 77 |
| | 3 024 |

[illegible] small number of engagements decorations earned during [illegible] in the Navy as in the Army and the medical branch [illegible] with this form of recognition of services efficiently performed. The R N A S B R however, can boast of four Distinguished Service Medals and one Meritorious Service Medal, while the names of three other reservists were brought to the notice of the Admiralty for valuable service rendered

The sick berth history would not be complete without mentioning that necessary concomitant of war—casualties The total number of reservists who lost their lives was 77 The names of those belonging to the Plymouth Command are commemorated on the Memorial erected at the R N Hospital, Plymouth those drafted to Portsmouth and Chatham are included on the Sick Berth Staff Memorials at the Naval Hospitals at Haslar and Chatham One of the greatest disasters that befell the Reserve was the loss of the Hospital Ship *Rohilla* whereby twelve men from the small Yorkshire town of Barnoldswick were drowned *Requiescant in pace*

When the country was beginning to settle down again after the war, steps were taken to re enrol the reservists who on demobilization had been declared to be free from any obligation for further service It was then found that these men were not willing to re enrol under the old conditions and requested that the conditions of service be amended with regard to —

(*a*) Their rating as compared with the active service sick berth staff

(*b*) Their rate of pay

The [illegible] training fee or bounty

This was not [illegible] considered at, as they had [illegible] with [illegible] naval reservists and had compiled notes During the war they had paraded and maintained their own uniform for many months they had no recognized status even the older experienced men were junior to the youngest sick berth attendant R N they received no recompense for long and faithful service

In 1921 the revised Regulations were published The most important alterations, as compared with the 1912 edition are —

(1) All men under 40 years of age are liable for general service Those over 40 may volunteer for either general service or home service

(2) Reservists are granted the same ratings as the active service sick berth staff up to that of chief petty officer, and receive the same rates of pay when mobilized and when undergoing training

(3) They receive an annual bounty of from £3 to £5 provided they carry out certain conditions as to training and efficiency

(4) On mobilization a complete free kit of naval uniform will be provided

Altogether the conditions of service were made much more simple and were brought more into line with the conditions laid down for the R N sick berth staff As soon as these Regulations were published, the old reservists re enrolled and became active recruiting agents, so that early in 1923 the maximum complement of 1275 had been enrolled

During 1922 and early 1923 the number of resignations was fairly large Some had attained the age limit some found that the necessary drills interfered seriously with the struggle for work some had not completely recovered from that war weariness which is still evident in the voluntary services Out of the full establishment of 1275 there are at the present time at least 600 men who saw active service in the R N A S B R

The establishment of the Reserve is now as follows —

| | |
|---|---|
| Sick Berth Chief Petty Officers | 24 |
| Sick Berth Petty Officers | 50 |
| Leading Sick Berth Attendants | 470 |
| Sick Berth Attendants | 308 |
| Probationary Sick Berth Attendants | 423 |
| | 1 275 |

In 1919 the R N A S B R Long Service Medal was instituted It is granted after twelve years service provided certain conditions are fulfilled At least 156 of these medals have already been issued and are a source of justifiable pride to their owners while one reservist also possesses a bar to the medal

The enthusiasm of these reservists is remarkable In 1922 the first complete year after the introduction of the revised regulations over 77 per cent did a seven days course of training either in naval hospitals or

[illegible] The length of training may appear absurdly short but in the large majority of cases, a week is the only holiday from work these men [illegible] How many of the readers of this article would give up even a portion of their annual leave in order to make themselves efficient in a subject apparently so remote from their usual employment?

What is behind this keenness to learn the art of nursing? It is undoubtedly the knowledge that their civil work is dangerous Accidents are frequent and early in life they are impressed by the idea that someone must know what to do to save a fellow worker's life and to relieve suffering in cases of emergency—someone who will be at hand and able to give skilled assistance at once. In consequence they take the earliest opportunity of obtaining the St John Ambulance Association First Aid Certificate and in order to gain regular practice and maintain their efficiency in this work they join the St John Ambulance Brigade Even then their zeal is not satisfied and they look for further opportunities of gaining fresh knowledge and experience in the immediate treatment of the sick and injured They find this object can be attained by joining one of the Reserve Forces—the Home Hospital Reserve and the Bearer Companies organized by the Army or the Royal Naval Auxiliary Sick Berth Reserve

But, you must ask, are they not also influenced by the sense of patriotism? The answer is most distinctly 'Yes' They have merely chosen the branch of service in which they consider their inclinations and ability will be of the greatest use to their country One man's inclinations run towards gaining proficiency in the use of a rifle and he joins the Territorial Army another man prefers to gain proficiency in tending the sick and injured, and he joins the R N A S B R or one of the Army Medical Reserves Are these two men not equally patriotic?

Such then is the history of the Royal Naval Auxiliary Sick Berth Reserve and the members of this Reserve may well be justly proud of their record Unless one is intimately associated with these men it is difficult to realize their enthusiasm and zeal, without which attributes no voluntary organization can be a success This enthusiasm is also evident among the Divisional Officers of the Brigade who are not themselves reservists and to their sympathetic interest and energy much of the success of the Reserve is due The future of the Reserve is assured so long as its members are drawn from such an able organization as the St John Ambulance Brigade

My thanks are due to the Chief Commissioner of the Brigade for permission to quote in full from the various publications already mentioned and to the Brigade Secretary and his clerical staff for their assistance in searching old records and compiling the various numerical data contained in this article

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[illegible]

[illegible]

[illegible] $CH_3COOH$ [illegible] into H and $CH_3COO$ [illegible] into H and $NO_3$ [illegible] and it is a matter of the fact that [illegible] are acids. In the same way alkalis [illegible] and a solution of [illegible] KOH into K and OH [illegible] free hydroxyl OH [illegible]

Monovalent [illegible] kations [illegible] hydrogen [illegible] whilst hydroxyl OH [illegible] $NO_3$ [illegible] and $CH_3COO$ [illegible]

When an acid [illegible] with the OH [illegible] H ions [illegible] OH [illegible]

Some acids [illegible] instance [illegible] as the [illegible] cules of acid [illegible] acid than the [illegible] acid HCl [illegible] Cl than acetic acid $CH_3COOH$ [illegible] $CH_3COO$. In the [illegible] of HCl an dissociation [illegible] expressed as [illegible]

In decinormal acetic acid [illegible] of the [illegible] dissociated.

An acid is only active chemically when it is dissociated [illegible] ions (written H) and anions (written Cl or $CH_3COO$). Decinormal hydrochloric acid is almost completely dissociated and is therefore very active whilst decinormal acetic acid is hardly dissociated at all and is therefore very weak.

It will be seen, then that the strength of an acid depends not upon the

number of molecules present in solution, but upon the number of dissociated hydrogen ions present.

*Hydrogen Ion Concentration.*—The weight of hydrogen ions per litre of solution is called the hydrogen ion concentration of that solution, and is represented by the symbol cH.

Water dissociates very slightly into hydrogen ions (H) and hydroxyl ions (OH); thus at 22° C. 1 litre of water contains one ten millionth part of a gramme of hydrogen ions. The hydrogen ion concentration of water (cH) is therefore said to be $\frac{1}{10000000} = \frac{1}{10^7}$ or $10^{-7}$.

But suppose hydrochloric acid is added to the water until it is decinormal HCl. Then:—

| | | |
|---|---|---|
| 1 litre of solution contains | 3.65 grm. of | HCl |
| 1 " | 3.55 " | Cl |
| 1 " | 0.1 " | H |

Eighty-ten per cent. of the HCl is dissociated into H ions and Cl ions. In 1 litre of water contains 0.081 gramme of H ions, but this is the hydrogen ion concentration of the solution as defined above; therefore the cH of decinormal HCl is 0.084 or $10^{-1.08}$.

In the same way if acetic acid is added to water until the solution is decinormal $CH_3COOH$:—

| | | |
|---|---|---|
| 1 litre of solution contains | 6.0 grm. of | $CH_3COOH$ |
| 1 " | 5.9 " | $CH_3COO$ |
| 1 " | 0.1 " | H |

In this case, the solution contains the same amount of hydrogen as the decinormal hydrochloric acid; this hydrogen, however, is only dissociated to the extent of 1.8 per cent.

1 litre of solution contains 0.1 × $\frac{1.8}{100}$ grm. of H ions = 0.00186 grm. of H ions.

Therefore the cH of decinormal acetic acid is 0.00186 or $10^{-2.73}$.

The hydrogen ion concentration of N/10 HCl is then 61½ times that of decinormal acetic acid; this is why the former is so much stronger than the latter.

In water there must obviously be as many OH ions as there are H ions, for each H ion is formed by the dissociation of a molecule of $H_2O$ into H and OH; the hydroxyl ion concentration (cOH) is therefore equal to the cH, that is $10^{-7}$. When the concentration of H ions and OH ions is equal the solution is neutral. According to the laws of chemistry the product of the cH and the cOH is always the same; if an alkali may be added to the water. Thus in pure water:—

$$cH \times cOH = 0.0000001 \times 0.0000001 = 10^{-7} \times 10^{-7} = 10^{-14}.$$

But if alkali be added to the water until there are ten times as many H ions as OH ions:—

[1] This is strictly true. It is sufficiently close to the truth for our purposes.

cH 0 000001 10 ⁶, l = cH × cOH must [illegible] cOH must now be 0 0 [illegible] 01 10 ⁸ In [illegible] added until there are 100 times as many H ions as there are in pure water cH = 10⁻⁶ and cOH = 10⁻⁹

If alkali is added until there are 100 times as many OH ions as there are in pure water cOH = 10 and cH = 10 ⁵, and the product of cH and cOH is always 10 ¹⁴.

This is a very clumsy way of writing the cH to avoid this difficulty Sorensen introduced what is known as —

*The pH Nomenclature.*—Instead of saying that decinormal acetic acid has a cH = 10 ³⁶ we write pH = 2 867 the number 2 867 being the negative power of 10 which is equal to the hydrogen ion concentration

In the same way the cH of pure water is 10 , which in the pH notation would be pH = 7 and if the cH were 10 ¹¹, the pH would be 11 The pH is really the logarithm to the base ten of the number of grammes of hydrogen ions in one litre of solution, omitting the negative sign From this it follows that —

| | |
|---|---|
| The pH of water (neutrality) is | 7 0 |
| " " acid is less than | 7 0 |
| " " alkali is greater than | 7 0 |

It is unnecessary to state what the cOH is for we know that cH × cOH is always 10 ¹⁴ we therefore state the alkalinity in terms of H ions and if the pH is 9 we know that the pOH is 14 − 9 = 5

It will be noticed that as the acidity increases, the pH decreases if the pH decreases by 1, the acidity increases ten times, and if the pH decreases by 2, the acidity increases 100 times A solution of pH5 contains 1 000 times as many H ions as a solution of pH8, and a solution of pH9 contains a million times as many OH ions as a solution of pH5

*Determination of cH.*—The hydrogen ion concentration cannot be determined by ordinary titration, for suppose 10 c c of decinormal hydrochloric acid and 10 c c of decinormal acetic to be titrated with decinormal soda; each will require 10 c c of soda to neutralize it—and yet we have seen that the cH of decinormal hydrochloric is 61¼ times the cH of decinormal acetic The reason for this anomaly is that acetic acid is only very slightly dissociated but when the dissociated ions have been neutralized by adding NaOH, further molecules of acetic acid are dissociated until finally no acetic acid is left The next drop of NaOH makes the solution alkaline, and the indicator (such as phenol phthalein) used for the titration changes colour

The cH can be estimated accurately by measuring the electrical potential of a hydrogen electrode immersed in the solution, but this is a difficult process requiring special apparatus In ordinary practice it is estimated sufficiently accurately by adding certain Indicators, which are liquids which change colour at some known cH Such an indicator is

[illegible] values below [illegible] will [illegible] all [illegible] in the following [illegible]

| [illegible] | [illegible] | [illegible] |
|---|---|---|
| [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] |

[illegible] the pH of any [illegible] and the [illegible] similar [illegible]

[illegible] values at which the [illegible] are commonly [illegible] alkali [illegible] neutralized an acid. This apparent [illegible] explained by the following [illegible]

[illegible] of titrations [illegible] is dealing with practically [illegible] pure decinormal ($\frac{N}{10}$) HCl is titrated with [illegible] When 19 c.c. of NaOH has been added the [illegible] total of $\frac{N}{10}$ HCl in 10 c.c. of liquid. The [illegible] HCl [illegible] this dilution nearly all the HCl is dissociated [illegible] pH [illegible] and the pH is about 3. Now add two [illegible] of NaOH the result is absolute neutrality pH 7. Now [illegible] drop of NaOH and the result is $\frac{N}{100}$ NaOH of which the pH [illegible]

[illegible] as indicated in the table the lowest begins to change [illegible] the highest has finished changing at pH 10. It will therefore [illegible] they have all changed over within four drops of $\frac{N}{10}$ alkali [illegible] half a drop of normal alkali. These differences of changing point are then negligible when dealing with pure, strong acids and alkalis. In impure solution of these substances one drop, more or less, will make a considerable change in the pH.

In the same way the exposure of pure water to the $CO_2$ in the air (1 parts per 10,000) will alter the pH from 7 to 6 and the trace of alkali dissolved out of a perfectly clean glass bottle by pure water might alter its pH from 7 to 8.

[illegible] HCl in the same way with [illegible] boiling point [illegible] Where [illegible] and [illegible] change [illegible] change [illegible] is [illegible]

[illegible] hints [illegible]

Suppose [illegible] and [illegible] [illegible]

[illegible]

[illegible] would [illegible] Suppose [illegible] ever that [illegible] some [illegible] the HCl [illegible] inverted [illegible] Now although [illegible] and only [illegible] H and CH[illegible] [illegible] extent its sodium salt—sodium [illegible] acetates very fr[illegible] and CH COO [illegible] the presence [illegible] of $CH_3COO$ [illegible] prevents the acetic acid [illegible] This [illegible] product of the number of CH COO [illegible] the number of H [illegible] must remain constant [illegible] the [illegible] of CH COO [illegible] the H ions must decrease.

H[illegible] from acetate to HCl, then not only converts the sodium HCl [illegible] but further prevents the already weak acetic acid from dissociating and therefore makes it still weaker.

The same kind of reaction takes place with all sodium salts of weak acids such as [illegible] bicarbonate ($NaHCO_3$) and disodium phosphate ($Na_2HPO_4$) [illegible] very freely present in all body fluids. Addition of strong acid such as HCl to these fluids has very little effect upon the pH for the [illegible] acid is at once converted into a very weak acid and [illegible]

It [illegible] that blood can have a large quantity of acid added to it without producing much change in its pH which is normally just on the [illegible] side of neutrality. Suppose for instance a quantity of dilute HCl [illegible] serum. The HCl reacts with the sodium bicarbonate [illegible] thus —

$$HCl + NaHCO_3 = H_2CO_3 + NaCl$$

so that [illegible] the strong acid (HCl) a weak acid (carbonic acid) which dissociates little [illegible] produced. Further the dissociation of $H_2CO$ into H and $HCO_3$ is [illegible] by the presence of the freely dissociating $NaHCO_3$ in the fluid —

$$NaHCO_3 = Na + HCO_3$$

[illegible] $HCO_3$ [illegible] [illegible] [illegible] that an instantaneous [illegible] of HCl [illegible] from [illegible] appreciably altering the pH of the blood for long in the whole [illegible] NaHCO and similar buffers is not [illegible]

[illegible] carbonic acid splits up readily into water and $CO_2$ ($H_2CO_3 = H_2O + CO_2$)—and $CO_2$ is excreted by the lungs. So that if HCl be run [illegible] from the strong HCl is replaced by weak carbonic acid which is [illegible] given off by the lungs and the pH of the blood remains [illegible]

When the HCl reacts with disodium phosphate, $Na_2HPO_4$ (which is a [illegible] present in the blood) in a similar way, producing monosodium phosphate $NaH_2PO_4$ (which is weakly acid) The strong HCl is thereby neutralized and the weakly acid $NaH_2PO_4$, produced in its place is rapidly excreted by the kidney

These properties of the blood are an adaptation to the requirements of metabolism When muscles act, for instance they may produce lactic acid and various other acids are constantly produced in the tissues and removed by the blood Metabolism cannot be carried on unless the reaction of the body fluids is just on the alkaline side of neutrality consequently the strong acids produced in the tissues are neutralized by the buffers in the blood and weak acids are formed instead, such as $H_2CO_3$ and $NaH_2PO_4$ which ionize little and are rapidly excreted by the lungs and kidneys An alteration of pH in the blood to 6 (instead of the normal 7 4) would cause death and yet the pH of pure water can be brought to this stage of acidity merely by exposure to the $CO_2$ of the air It is to prevent such slight changes as this in the blood reaction that buffers are necessary

The buffers so far mentioned are in the plasma of the blood but there exists in addition an arrangement for "secondary buffering" between the plasma and corpuscles

*Secondary Buffering* —Both hæmoglobin and oxyhæmoglobin are weak acids but oxyhæmoglobin is the stronger of the two This is very convenient for hæmoglobin is converted into oxyhæmoglobin in the lungs where $CO_2$ is given off by the plasma so that as the plasma becomes less acid by giving off $CO_2$ the corpuscles become more acid by changing hæmoglobin to oxyhæmoglobin In the tissues the opposite happens, the plasma becomes more acid by taking up $CO_2$ and the corpuscles become less acid by giving up their oxygen and converting oxyhæmoglobin to hæmoglobin

The $CO_2$ taken up by the plasma in the tissues acts upon the sodium chloride and water in the plasma in the following way —

$$CO_2 + H_2O + NaCl = NaHCO_3 + HCl$$

The HCl so formed leaves the relatively more acid plasma and enters the relatively less acid corpuscles, thus restoring the balance between them In the lungs the opposite happens the plasma becomes relatively less acid by giving off $CO_2$ and the corpuscles become relatively more acid by

[illegible]

[illegible] $CO_2$ [illegible] $(CH_3)_2CO$ [illegible] obvious a [illegible] the lungs to the tissues and $CO_2$ [illegible]

There is another mechanism [illegible] the pH [illegible] abnormally acid

Under normal conditions ammonia [illegible] are converted [illegible] elsewhere to urea $[(NH_2)_2CO]$ which [illegible] dissociation [illegible] neither acid nor alkaline If acids are produced [illegible] abnormal extent however the amino acids [illegible] urea, are converted into ammonium carbonate $(NH_4)_2CO_3$ [illegible] carbonate is strongly alkaline and neutralizes any acids [illegible] circulating in the blood, being secreted in combination with [illegible] in the urine In conditions in which abnormal amounts of acids are produced in the body the urine tends to contain less urea than normally and much more ammonia

The respiratory centre in the medulla is remarkably sensitive to changes in the pH of the blood, and although the buffers as we have seen prevent any large change, a small increase in acidity is produced when acid is added to the blood This small increase in acidity is principally due to the presence of more $CO_2$ in the blood and is sufficient to stimulate the respiratory centre to increase respiration and get rid of the excess of $CO_2$ thus restoring the pH to normal

It will be noticed that all the defences of the body so far mentioned are directed towards the elimination of excess of acids Acids are normally produced in metabolism and the mechanism for dealing with them is very perfect But what happens if excess of alkali is run into a vein?

It has recently been customary to run quantities of sodium bicarbonate into the veins of patients suffering from so-called acidosis this is a dangerous practice unless carefully controlled for although the arrangements for disposing of excessive acid are very good excessive alkali is never formed in the ordinary course of nature and the body has no very satisfactory way of getting rid of it rapidly

The pH of the blood is regulated by the buffers, principally sodium bicarbonate which is a weak alkali Normally the proportion of carbonic acid molecules to sodium bicarbonate (or alkali) molecules in the blood is as 1 is to 20, i e,

$$\frac{[H_2CO_3]}{[NaHCO_3]} = \frac{1}{20}$$

If the carbonic acid is in excess of this proportion the blood is too acid for life to continue long, whilst if sodium bicarbonate is in excess the blood is too alkaline When they are in the proportion of 1 to 20 the acid balances the alkali and the pH of the blood is normal

If more $CO_2$ is produced [illegible] the tissues it increases the carbonic acid in the blood [illegible] that the [illegible] the pH is changed to the left [illegible] and the respiratory centre is stimulated [illegible] until the ratio returns to $\frac{1}{20}$.

If there be an production of acid substances such as lactic acid and [illegible] NaHCO is has been explained [illegible] neutralized by the sodium [illegible] $H_2CO_3$ and [illegible] NaHCO, again alters the [illegible] and the [illegible] pH [illegible] acid the respiratory [illegible] $CO_2$ [illegible] the lungs until the ratio $\frac{1}{20}$ is restored [illegible] NaHCO [illegible] the ratio $\frac{1}{20}$ is altered and [illegible] pH [illegible] way the blood becomes [illegible] the effect of this on the respiratory [illegible] and the animal stops breathing [illegible] (N.B.—this statement is not [illegible] as certain other factors [illegible] matter.)

[illegible] compensated in two [illegible]

[illegible] $CO_2$ and other acids [illegible] pH normal [illegible] this time the animal gets [illegible] die from lack of oxygen [illegible]

[illegible] *Acidæmia.* When the pH of the blood is on the acid [illegible] equivalent to acidæmia, and when it is on the [illegible] it should be spoken of as alkalæmia. The word [illegible] together as it is used by different people [illegible] meanings and is now only a source of confusion [illegible] before the pH was properly understood and [illegible] acidosis and by others as meaning [illegible] as acidosis [illegible] reduction in bicarbonate [illegible] all alkalinity.

[illegible] the [illegible] in the metabolism of sugar that [illegible] unable to break [illegible] glucose ($C_6H_{12}O_6$) into its ultimate [illegible] and $H_2O$.

[illegible] not important to understand the breaking up of glucose [illegible] related to the breaking up of fats into their ultimate [illegible] ($CO_2$). When insufficient glucose is being burnt up in [illegible] stimulated this fats cannot be completely [illegible] The following substances are formed instead:—

[illegible] acid — [illegible] $CH_3CHOH.CH_2.COOH$
[illegible] acid — $CH_3.CO.CH_2.COOH$ and
[illegible] $CH_3.CO.CH_3$

[illegible] compared to the burning fat on a fire

[illegible] when plenty [illegible] being [illegible] smoke but if the [illegible] little [illegible] lized in the [illegible] resembles [illegible]

[illegible] known as [illegible] starvation [illegible] present in the blood [illegible] breath.

Ketosis may [illegible] of the blood [illegible] of the blood [illegible] present [illegible] In the [illegible]

[illegible]

We [illegible] that when [illegible] —

$$HC[illegible] + H_2CO$$

[illegible] But the [illegible] this [illegible] of the [illegible] the blood.

[illegible]

We [illegible] in order [illegible] the pH of the blood [illegible] proportion [illegible] of $H_2CO$ [illegible] If the [illegible] this [illegible] and the pH [illegible] acid [illegible] $H_2CO$ [illegible] $NaHCO$ [illegible] but although [illegible] amounts of [illegible] and NaHCO [illegible] carry less [illegible] the amount [illegible] produced [illegible] when [illegible] little excess [illegible] is possibly partly [illegible] reduced [illegible] because [illegible] by [illegible]

[illegible] ut factors [illegible] in the state of [illegible] out of [illegible] [illegible] alkaline content of the blood is not of primary importance [illegible] in the disease all of DIABETES.

[illegible] content of the blood is also reduced in ketosis although [illegible] may not be [illegible] associated with it. The acid ketone bodies [illegible] combine with NaHCO, leaving $H_2CO_3$ which is excreted by [illegible] lungs. There is no ammonia but some of the bicarbonate of the [illegible] is lost. When a great proportion of the $NaHCO_3$ has been lost [illegible] it is necessary that the blood should contain very little $H_2CO_3$ to [illegible] the ratio $\frac{[H_2CO_3]}{[NaHCO_3]} = \frac{1}{20}$. As the blood bicarbonate continues to be [illegible] by the continuous formation of ketone bodies a point is reached [illegible] blood has to carry away more $CO_2$, produced in the tissues [illegible] small amount of bicarbonate still left can neutralize. The result [illegible] and air hunger. It will therefore be seen that the rational [illegible] averting impending coma is to give quantities of sodium bicarbonate [illegible] the buffers of the blood, to stop all intake of fat which [illegible] the ketone bodies and to give glucose and insulin which will burn [illegible] ketones already circulating in the blood.

[illegible] bicarbonate should, however, only be given so long as the urine remains acid, for if excess is given (as it easily may be intravenously) a state of alkalæmia will be produced which may cause apnœa and death, as we have seen. As soon as the acid bodies in the blood have been neutralized, the urine instead of being highly acid, will become alkaline, then the alkali treatment should be stopped and restarted as soon as the urine becomes acid again.

If alkali is to be given by the mouth it is best to give it in the form of sodium citrate, for this is converted into sodium bicarbonate on absorption into the blood, whereas if sodium bicarbonate is given by the mouth it is largely neutralized by the gastric juice, does not so readily get into the blood, and upsets the digestion.

If one is certain that acidæmia is present and there is urgency a moderate quantity of bicarbonate may be given intravenously and thereafter a drachm or more of sodium citrate every two hours, examining the acidity of the urine before each dose is given. In this way alkalæmia may be avoided, but unless a person highly skilled in chemical examination of the blood is available it is almost impossible to be certain that acidæmia exists in any particular patient. No single test is absolutely reliable and all the tests are difficult to carry out, especially upon a sick person. Even the clinical signs—air hunger, presence of aceto-acetic acid in the urine, and highly acid urine containing an excessive amount of ammonia bases—may be present without any acidæmia. On the whole, then, it is usually unwise to give bicarbonate intravenously, but there is never any objection to giving alkalis by the mouth so long as the urine remains acid, if there is any reason to suspect acidæmia.

[illegible]

As has [illegible] burette into bl[illegible] buffers such [illegible] the addition of [illegible] about pH [illegible] there is reduction [illegible] already) less acid will b[illegible] litmus to "acid to litmus" [illegible] is not of much importance from my point of view [illegible] reason for mentioning it is that formally people applied the term [illegible] to conditions where less acid than usual was necessary to convert [illegible] from alkaline to litmus to acid to litmus Many at these people [illegible] to think that this condition of reduction of titratable alkalinity of [illegible] was due to the blood being less alkaline than usual whereas as [illegible] seen the blood is not necessarily either more or less alkaline w[illegible] titratable alkalinity is reduced, but its pH may be exactly [illegible] usually is during life

Uræmia may cause acidæmia and reduction of bicarbonate [illegible] the blood in much the same way as diabetes but no ketosis [illegible] bodies causing this acidæmia are as yet unidentified but they can[illegible] hunger. They are presumably products of metabolism which the kid[illegible] should have excreted

### Conditions causing Alkalæmia

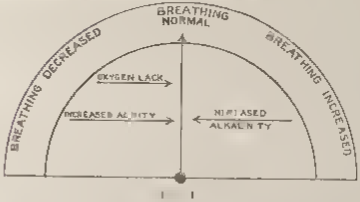
The most obvious of these is administering excess of alkali as a [illegible] and we have seen there is danger of causing anuria and death by d[illegible]

*Mountain Sickness*—The respiratory centre in the medulla is stimulated by increased acidity of the blood so that breathing becomes deeper and more frequent and $CO_2$ is washed out to restore the pH to normal The respiratory centre is also stimulated by lack of oxygen even if the pH remains normal

The atmosphere contains about 21 per cent oxygen and at sea level the normal barometric pressure is 760 mm Hg This means to say that at sea level 21 per cent of the barometric pressure is due to oxygen so that the pressure of oxygen is about 160 mm Hg If a man goes to the top of a mountain 18,000 ft high the barometric pressure falls by a half to 380 mm Hg but the air still contains 21 per cent oxygen therefore the pressure of oxygen also falls by one half to 80 mm Hg Now this fall of the pressure of oxygen to one half has the same effect as if the man were to stay at sea level and breathe an atmosphere containing only half the percentage of oxygen, so that when he is 18 000 ft up the man is only breathing what would correspond to 10½ per cent of oxygen at sea level There is therefore, a tendency to lack of oxygen in the blood and this lack

[illegible] is the respiratory [illegible] in the medulla to speed up the [illegible] amount of [illegible] in the tissues and carried [illegible] is much the [illegible] in a minute is 18 000 up and the [illegible] the blood [illegible] quickly by the deep breathing. The [illegible] the [illegible] in the form $NaHCO_3$ [illegible] is [illegible] in the blood [illegible] means the same [illegible] this mat[illegible] that is to say the [illegible] all alkaline that is to say the [illegible] $CO_2$ is washed out of the blood [illegible] the result is that the breathing [illegible] of $CO_2$ in [illegible] This is what [illegible] very deep [illegible] breathing because the $CO_2$ [illegible] gradually [illegible] again until [illegible]

[illegible] balances a balance to [illegible] $CO_2$



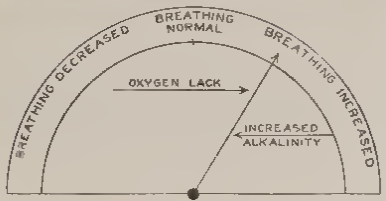

[illegible]

[illegible] of affairs may be illustrated by a diagram (fig. 1). The [illegible] centre is like a lever which is pushed to the right by lack of [illegible] to use of acidity of the blood and to the left by increase of [illegible] of the blood. So long as the pH of the blood is normal and [illegible] oxygen lack the lever remains vertical and the breathing is [illegible] is lacking or acidity is increased the lever moves to the [illegible] is increased if the alkalinity is increased the lever [illegible] and breathing stops. If the alkalinity is increased and [illegible] at the same time the lever strikes a balance between [illegible] breathing is slightly increased (b[illegible])

[illegible] happens (amongst other things) to people who are acclima[illegible] [illegible] until this balance has been struck the lever is [illegible] to the right by oxygen lack and then to the left by alkalinema [illegible] symptoms of dyspnea followed by apnea

[illegible] with the normal [illegible] the body, especially the [illegible] of oxygen. The [illegible] power [illegible] [illegible] to [illegible]

[illegible] following, with the [illegible] prevent the [illegible]




*Pneumonia and Heart Failure.*—Much the same kind of thing happens in cases of pneumonia and heart failure. These patients apparently are often are suffering from lack of oxygen and not from excess of $CO_2$ in the blood. In fact the rapid breathing tends to wash out the $CO_2$ from the blood excessively and thus the blood may have an alkaline reaction. It is rational to relieve them of oxygen want by giving them oxygen to breathe, and it may be mentioned incidentally that the best way of giving them oxygen is through a catheter which is passed through the nose into the naso-pharynx. The old nasal catheter is extremely wasteful, hardly increases the oxygen in the air breathed in all, and requires constant attention, whilst a catheter so passed can be stripped to the cheek.

This paper is only intended to deal briefly with some of the aspects of the subject. References are given below to some of the publications consulted which give much more detailed information.

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# Naval Medical History of the War

## SECTION OF TROPICAL AND SUB TROPICAL MEDICINE

*(continued)*

### PART II.—(i) DYSENTERY (ii) LIVER ABSCESS, (iii) SPRUE AND (iv) EPIDEMIC DIARRHŒA

By Vice-Admiral Sir LEROY BASSETT SMITH, K.C.B., C.M.G., R.N. (Ret.)

*(Continued from p. 211.)*

#### [illegible] MEAL IN THE TREATMENT OF DYSENTERY

[illegible] 1917 M. Laige of Menton, offered to the British [illegible] specially prepared food which he called "Torrified [illegible] opinion that this would be efficacious for the treatment [illegible] especially dysentery. The offer was accepted and [illegible] several lots of flour which he had prepared and these [illegible] report.

[illegible] it is stated that by using "Torrified Meal" [illegible]

[illegible] sailors suffering from intermittent dysentery would [illegible] in a few days.

[illegible] from dysentery for six months would be [illegible]

[illegible] severe dysentery for ten years would [illegible] in two months, the late of cure depending upon the [illegible] lungs.

[illegible] the prepared meal fermentations would [illegible] that the [illegible] able to take on its normal functions [illegible] less one [illegible] He also held that the meals so pre[illegible] against the dysenteric organisms [illegible] the starch into dextrin and the [illegible] easily assimilated. He stated [illegible] cases of infantile diarrhœa [illegible]

[illegible] should be made with [illegible] suffering from intermittent dysentery [illegible] months duration, and five [illegible] to ten years. He stated [illegible] would have solid or normal stools not

[illegible] to three a day all pain would vanish, but that the patients [illegible] not increase for some considerable time

[illegible] for the treatment extending over ten days was as [illegible]

*[illegible] Days.*—An exclusive diet of torrified meal and water made [illegible] as much as the patient can take given four times a day with [illegible] to drink

*[illegible] Day.*—The meal to be mixed with strained vegetable broth or [illegible]

*[illegible] Fifth Day.*—Meal to be mixed with vegetable broth or milk

[illegible] of various kinds (1) made from the best American [illegible] (2) bean flour (3) barley flour and (4) rice flour Only small quantities of the last three were received and the experiments were [illegible] with the wheat flour

Mr Large, who is an enthusiast on the subject, had devoted several [illegible] in attempting to obtain the very best results by his heating process [illegible] seemed expedient to give the food most careful consideration [illegible] chemical analysis of it was made by Mr R C Frederick who gave the following report of its constituents —

*Wheat Flour.*—A brownish soft substance free from any adhesive properties, and with a sweetish odour Microscopically there were a number of unbroken starch granules similar to wheat starch by polarized light and a quantity of irregular shaped particles

| | Torrified meal | Per cent | Ordinary wheat flour (analysis given of moisture) (Hassall) |
|---|---|---|---|
| Carbohydrates | 76 3a | — | 57 0 |
| Albuminoids | 9 07 | — | 13 15 |
| Nitrogen 1 60 | — | 2 10 | — |
| Fat | 1 09 | — | 1 39 |
| Fibre | 0 93 | — | 0 12 |
| Ash | 0 61 | — | 0 [illegible] |
| Moisture | 6 13 | | 6 62 (12 80) |
| Not estimated | 4 94 | — | — |
| | 100 00 | | 100 00 |
| Gluten | Nil | — | 11 0 per cent |

The torrified meal which is heated and sieved many times in its preparation thus shows an absence of gluten with a diminished amount of water and fat in it The gluten was stated by Mr Large to be separated into albumenoids and pulverized fibres The former appear to have been removed from the meal and the latter is gluten and gliadin [illegible] but not in the form of particles as claimed In one of the three samples were fresh granules definitely resembling gliadin and the amount of fibrous matter was large In these considerations, therefore, it appears that this

Figure 14

[illegible] would give only a starvation diet, being [illegible] in proteins and thirty from [illegible] of preparation it must be [illegible] all nutritive properties [illegible]

BACTERIOLOGICAL TESTS

Two per cent of each of the samples of torrified meal was added to nutrient agar similar to the method used in making pea-flour trypsinized agar for the culture of the meningococcus, and plates of these media were then inoculated lightly with *B typhosus*, *B dysenteriæ* (Shiga), and *B coli com*, to observe if there was any apparent inhibitory power in these meals In no case was the growth less than in the control plates

Two per cent was added to litmus peptone water and the tubes were inoculated with Friedlander's bacillus and *B coli com* Growth occurred in all the tubes There does not therefore appear to be any antiseptic property in the meal able to diminish the growth of ordinary intestinal organisms when tested *in vitro*

ANIMAL EXPERIMENTS

A series of experiments with guinea pigs was then carried out to demonstrate these points and the results are graphically shown by weight curves of the animals but it must be understood that it was extremely difficult to get the animals to take sufficient of the food and it was necessary to have recourse to hand feeding and also to give some of the flour in cakes of sufficient dryness

*Experiment* 1 —With meal and water only

(*a*) Pig 370 grm There was a steady fall in weight to 250 grm when on the tenth day the animal appeared so weak it was put back upon ordinary diet, after nine days it again begun rapidly to regain weight and recovered

(*b*) Pig 120 grm Rapid fall of weight, and it died on the seventh day 310 grm *Post mortem* showed serous haemorrhages congestion of the lungs, and a very watery state of the blood—pre scurvy condition

(*c*) Pig 420 grm Rapid fall in weight to 290 grm on the twelfth day It was then put on ordinary diet and steadily recovered

*Experiment* 2 —With meal and vegetable broth (celery, carrots, turnips, and onions)

(*a*) Pig, 450 grm There was a rapid fall in weight to the tenth day (320 grm), then a partial recovery The animal remained very thin and on the forty fourth day the weight was 350 grm and normal food was started but it again lost weight and died on the forty eighth day convulsed *Post mortem* There were no definite signs of scurvy, no haemorrhages and the joints were not swollen Simple inanition

(*b*) Pig 370 grm Rapid loss of weight and on the eleventh day died from simple inanition

*Experiment* 3 —Meal and unboiled milk

Pig 380 grm For the first five days it lost weight rapidly then more slowly to the eighteenth day It was very emaciated and its coat was staring but there were no tender joints or haemorrhages Normal feeding was then started, and the animal slowly recovered, and commenced again to grow

[illegible] juice

[illegible] marked secretion [illegible] no appetite [illegible]

[illegible] water with [illegible] milk or with [illegible] With water and [illegible] shun combined with milk or [illegible] and the life of the animal was [illegible]

[illegible] *Cases of Dysentery Cases according to the* [illegible] —Recovery [illegible] the food alone contained no [illegible] it was [illegible] by fresh lemon juice and [illegible] was also [illegible] palatable by the addition of [illegible] as well as taken in fluid [illegible] the diet but the patients [illegible] rarely suffered any [illegible]

[illegible] Eastern Mediterranean [illegible] little mucus in the stools but [illegible] attained well but lost 5 lb in [illegible] to the normal diet The symptoms all [illegible] to duty

Case [illegible] —A [illegible] found on contracted in the Eastern Mediterranean [illegible] bacillus He lost 3 lb in weight during the course [illegible] kept well

Case 3 —A [illegible] treatment The stools contained mucus [illegible] He lost 2 lb in weight during the course but the [illegible] He slowly recovered and was discharged [illegible] for 10 days

Case 4 —A [illegible] contracted in France During the course he lost 3 lb [illegible] recovery

Case 5 —A [illegible] in three years ago The stools on admission [illegible] Flexner's bacillus and there were [illegible] He stood the course well and the motions [illegible] were still frequent He did not lose weight the [illegible] and he gained a stone in weight before leaving [illegible] up to 11st No medicinal treatment was used in any of the cases

The results of the clinical trial were therefore favourable The food was distinctly non irritating gave rise to no gaseous distension or peristalsis, and tended to induce healthy stools in a comparatively short time but it was not possible at the time to say whether the improvement in such chronic cases would be permanent It was evident, however, that the results of the treatment were encouraging and worth further trial when the co-operation of the patient could be obtained It is essential that a certain amount of natural acidic substances should be given with the food and that the patient should be kept warm in bed

[illegible]

[illegible] In 1917 there was one [illegible] hospital [illegible] dysentery which was [illegible] hepatitis [illegible] and the case was [illegible] name One [illegible] Following amœbic dysentery [illegible] contracted at Gallipoli [illegible] was only found [illegible] Dr from H M H S [illegible] dysentery [illegible] on board

No hospital case is recorded [illegible] 1917 It must however be borne in mind that many [illegible] Royal Naval Division and the Indian Lines were treated in [illegible] hospitals [illegible] which we have no [illegible]

In 1918 H M H S *Kampala* [illegible] this man died on board [illegible] It is [illegible] considering the number of *E histolytica* [illegible] low [illegible] instances of this [illegible] points to the fact of still greater importance [illegible] measures with regard to healthy carriers [illegible] with statistics are only slightly dangerous [illegible] dysentery in temperate climates and who [illegible] suffer from the dangerous sequelæ themselves

## (m) SPRUE

This disease is not common in the Naval Service but occasional cases occur contracted by officers and men who have spent long on the China Station During the war however there have been a very considerable number of what may be called post dysenteric sprue cases with definite dysenteric history and followed by some of the symptoms recognized as being common in sprue namely sore tongue bowel ulcers large fermenting stools these signs being often of a temporary nature only the case recovering or being invalided and the subsequent history of the case not known

The following is an interesting case of advanced sprue that occurred in 1918 in a man who, some weeks before death had associated symptoms of beriberi a condition not previously described for cases of sprue

The patient a male, aged 45, contracted the disease on the China Station in 1911 13 probably at Shanghai He had suffered from many relapses of diarrhœa and sore tongue but more frequently during the past two years In July 1918 he was admitted to the Royal Naval Hospital Plymouth for chronic rectitis and the disease was then diagnosed as sprue the stools being pale bulky and fermenting He was extremely emaciated and debilitated and weighed 84 lb On September 19 1918 he came under my charge at the Dreadnought Hospital Greenwich The condition then was that of a typical case of sprue in the last stage The temperature was subnormal pulse 74, respirations 24 and his mental

[illegible] was generally [illegible]. There was [illegible] increased pigmentation [illegible] nipples [illegible] The [illegible] were pearly white [illegible] glazed [illegible] abdomen was [illegible] very [illegible] solid [illegible] trace of [illegible] The [illegible] blood pressure was [illegible] low tension [illegible] red cells 1,180,000 [illegible] white cells 3,200 [illegible] 34 [illegible] 2 per [illegible] were secondary [illegible] nucleated red cells.

Until [illegible] showed signs of improvement but on September 3 he complained of [illegible] cramps in right hand and wrist. These were relieved by [illegible] the 24th he felt well but for the cramps, and passed a large [illegible] midday definite tetany set in: chronic spasm of right hand [illegible] and forearm. The deep reflexes were lost, but the muscles reacted. The condition rapidly became worse with collapse, intense pain and sweats, the spasm spreading up the arm and across the chest, with a marked trismus typical risus sardonicus, and the right leg was slightly affected. The bowels acted involuntarily. Oxygen was administered, an ether injection given subcutaneously, and also a turpentine enema. At 2.30 p.m. the trismus had passed off and he felt much better, but the hand was still clenched. At 3 p.m. he was taking food and felt more comfortable but was very weak. Calomel was given with Dover's powder and he was ordered a course of thyroid extract.

There was no return of the tetany but the general condition did not improve and on October 3 slight pyrexia with pulmonary symptoms came on. He died on the [illegible] quite quietly in the night from heart failure apparently free from pain.

*Post mortem* showed a complete absence of fat in the tissues. The heart ([illegible] oz.) was very small and superficial white patches were present. The intestines contained much soft faecal material; no ulceration was found anywhere, but the walls were very thin, especially those of the lower part of the jejunum and ileum. The mesenteric glands were enlarged. The spleen was small and free from adhesions and weighed 1½ oz. The liver appeared normal, weighing 3 lb. The kidneys were both large, pale, and weighed 4 to 5 oz. The pancreas appeared normal and the thyroid was atrophied. The left pleura was adherent throughout and both lungs showed intense oedema, most marked at the bases.

A microscopical examination of the organs was made. The liver showed a slight amount of multilobular cirrhosis. In the kidneys there was some evidence of chronic tubular nephritis but no infarcts or haemorrhages. The lungs showed haemorrhagic and catarrhal infiltration of localized areas. The pancreas appeared to be normal. Sections of the small intestines showed atrophy of the villi with a small celled infiltration in the submucosa, and in this layer were a number of stout, oval and slightly curved rather large Gram positive bacilli, but no evidence of yeast like cells could be found.

The chief interest in the case lies in the severe attack of tetany which came on late in the disease from no apparent cause other than some intestinal irritation; its unilateral character as far as the limbs were concerned, and the severe bilateral trismus; the extreme emaciation of the patient making the contracted muscles stand out more prominently even than usual. The rapid action of the subcutaneous injection of ether in relieving the spasm is noteworthy.

## EPIDEMIC DIARRHŒA

[illegible] S F DUDLEY [illegible]

[illegible] it is given as [illegible] danger of flies [illegible]

At the Aircraft Depot Dunkirk in the [illegible] 15 August 1917 there was an epidemic of diarrhœa [illegible] of 1 400 [illegible] cases were actually admitted to [illegible] and there were [illegible] twice as many more who never [illegible] The vast proportion of these cases fortunately were very mild but a considerable number were dysenteric passing blood and mucus and became seriously ill A [illegible] in a neighbouring hospital died of this type of diarrhœa The writer had some of the stools examined on several occasions none of the ordinary pathogenic organisms were ever isolated but Morgan No 1 bacillus was very frequent though it is considered only a saprophyte by most authorities Cases were frequent in other camps and aerodromes of the district but nowhere did the number approach those in the Aircraft Depot The sanitation of the R N A S part of the Aircraft Depot was as good as that of the other aerodromes in fact the Admiralty inspecting expert said the arrangements there were the most satisfactory he had seen But at the Depot the fly question was heartbreaking Everything possible was done to destroy the flies and protect the food and screen the excreta, but the whole campaign was useless owing to the impossible condition of the French camp who shared the St Pol aerodrome with the R N A S They shot their garbage often actually into the Depot precincts Their excreta and latrines were left exposed ungarded and unburied Repeated private official and even finally ministerial protests had no effect till after the fly season was over Flies literally swarmed everywhere The weather at the time was favorable and twice during the season a week of cold weather occurred during which the flies almost disappeared and following which the incidence of diarrhœa cases decreased to almost nothing The weather improved the flies returned and in a day or so quinces of diarrhœa cases were waiting outside the sick bay hut

## PART IV.—MEDITERRANEAN OR UNDULANT FEVER

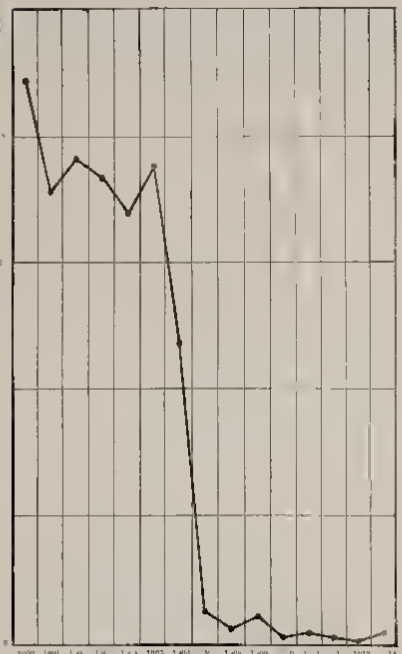
By [illegible] BASSETT [illegible] C.M.G.
[illegible]

In the [illegible] this fever was [illegible] Mediterranean [illegible] on account of its infinitely and [illegible] It is frequently developed in the hospital [illegible] Malta [illegible] other diseases such as typhoid or even [illegible] and [illegible] its active onset only occurred after patients had returned to England.

It was not until after the institution of the Royal Society's Commission, under Sir David Bruce, which had been working for two years and gave its final report in 1906, that the usual source of infection was traced to the milk of the native goats, which animals appeared to be perfectly healthy at the time the goats were being cut in their milk large quantities of the infecting organisms. From these investigations, which led to the compulsory [illegible] of all fresh milk used in the Service or the employment of [illegible] milk, this disease was practically abolished, and an enormous [illegible] of money, time and distress was brought about. No modern [illegible] preventive work has been more successful, or of greater use to [illegible]. In 1904 there were 430 cases in the Navy, with 28,458 days [illegible] and [illegible] deaths; in 1907 this was reduced to twelve cases, but in [illegible] population of Malta it still remained high (457 cases).

[illegible] is very widely distributed geographically. The island of [illegible] is one of the main endemic centres, but this fever is found all around the Mediterranean littoral in Spain, France, Italy, Greece, the Levant, [illegible] Tunis and Algiers, and it is present in the Islands of Sicily, [illegible] Corsica, Sardinia and Corsica.

[illegible] the past few years its extension to districts far from the sea has [illegible] in Spain, Portugal and France, and this extension inland is a [illegible] epidemiological fact. Leaving the Mediterranean endemic [illegible] it is at Suakin and Aden; in India it has long been known to [illegible] the Punjab. In China cases are found in the Yangtse valley. In tropical Africa it is found in areas extending from the Soudan, by the Blue Nile, in Uganda and in Northern Nigeria. After the Boer war the disease became very prevalent in the Transvaal and Orange River Colony; in America there appears to be an endemic centre in Texas extending into New Mexico and probably to California, while in South America cases have been reported from Peru. Thus the disease is seen to be mostly sub-tropical in distribution. Wherever it occurs endemically goats in herds are practically always present and although the Maltese goat, which has been widely exported on account of its great milking value, is the most frequent offender, yet any goats are susceptible of infection and from these it may spread to other animals, cows, mules, horses, dogs and man.

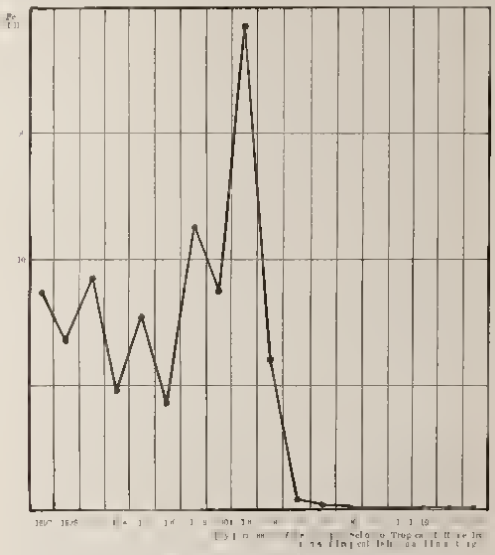



[By permission of the Liverpool School of Tropical Medicine from Dr. Ross of Dr. [illegible] Mr. [illegible] new logy.]

**Showing Incidence of Undulant Fever in the Mediterranean Squadron**

N.B.—One division of the scale represents 5 per 1,000

A very interesting account is given by Legge of the [illegible] When the goats are brought down from the hills in Corsica to the town, many of the women who milk them become infected through the hands by the *Micrococcus melitensis* in the milk. The milk is afterwards converted



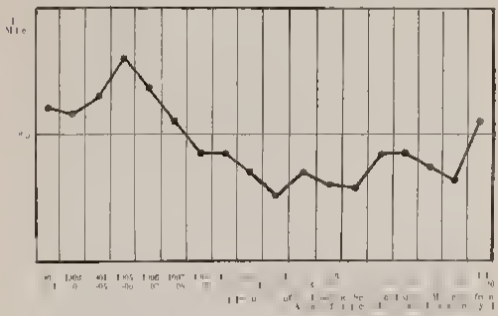
Showing the incidence of Undulant Fever in the Malta Garrison

N.B.—One division of the scale represents 20 per 1,000

into the fresh cheese so commonly used in this area. The women themselves rarely or never drink the milk. One infected goat may infect healthy herds when introduced among them and these may infect the dogs and goat men. In Spain and France the same thing occurs. Though the

[illegible] ingestion of the milk is undoubtedly the most [illegible] source of infection, the products of the milk are also very dangerous in the endemic areas. Such products are fresh native cheese and ice cream.

The infecting organism may be directly inoculated through abrasions of the skin and Sejournant goes so far as to say that though in towns the usual source of infection is by drinking the contaminated milk, in the rural districts it is mostly caused by direct infection or inoculation of infected soil in milk or otherwise. The fact that the infecting organism is passed out by the urine and fæces should make us look upon all cases as potentially infective, which necessitates the disinfection of all excreta, &c., and warning the nurses accordingly.



Showing Incidence of Undulant Fever in the Civil Population of Malta.
N.B.—One division of this scale represents 5 per 1,000.

At the commencement of the Great War, the importance of maintaining all the precautions against the ingestion of infected milk and foods was specially brought forward by a general order, as the older officers who had witnessed the disastrous results in the early part of the present century, had to a great extent been replaced by younger ones who had not had this experience. It was thought that the aggregation of so many men, who would be of different nationalities and habits, into small areas where flies abounded would greatly favour the development of the fever, especially under conditions of high temperature and lowered resistance from fatigue. Happily this fear was not realized, for there have been but few cases in the Navy during the five years, though these appear to have rather increased in 1918.

TABLE OF CASES

| | 1914 | 1915 | 1916 | 1917 | 1918 |
|---|---|---|---|---|---|
| Malta Hospital | | | | | |
| English | 5 | 7 | 6 | 6 | 8 |
| French | 2 | 3 | 1 | 0 | 1 |
| Maltese | 1 | 2 | 2 | [illegible] | [illegible] |
| Total | 8 | 12 | 9 | [illegible] | 11 |
| Hospital Ships Mediterranean | | 6 | 3 | 11 | [illegible] |
| East Coast | | — | — | | |
| East Indies | | 4 | — | | |
| Bermuda | — | — | 1 | | |
| Total | 8 | 22 | 13 | 17 | 36 |
| | | | 88 | | |

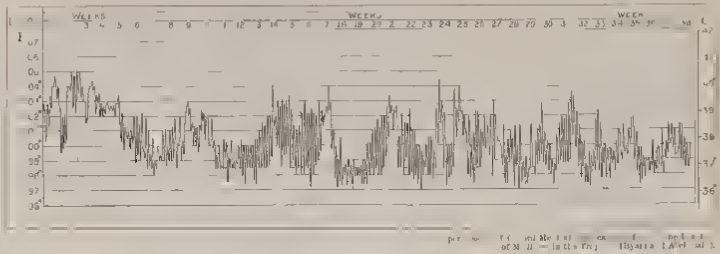
Of this total of eighty-eight there were nineteen Maltese and six were French reducing the English case to sixty-three for the five years or an average of 12·8 a year with one death.

When the great increase of the force employed in the Mediterranean and the special risks it ran are considered this result is very satisfactory. Eighty-three cases were included in the Mediterranean area and of these twenty were received direct from the hospital ships *Somali*, *St Margaret of Scotland*, and the *Karapara*. Four cases were received from the East Indies—all Maltese and probably the disease was contracted in Malta—and one case from Bermuda.

The infecting organism *M. melitensis* though frequently spherical is often coccoid or like a cocco bacillus during cultivation. Hess and other American authors call it a bacillus. Mayer and Shaw have grouped it with the *B. abortus* found in cattle and pigs. This relationship is very important with regard to the milk agglutination test for the detection of the disease in animals. As far as the writer has been able to judge from examinations of strains of *B. abortus* given to him, they have the same morphological, cultural and agglutination characters as the *M. melitensis*. The serum of a case of true undulant fever contracted in the Mediterranean and under treatment in his wards, gave the following reactions:—

SERUM OF UNDULANT FEVER CASE

| | Dilution | | | | | | | Control serum |
|---|---|---|---|---|---|---|---|---|
| Organism used | 40 | 100 | 400 | 1 000 | 2 000 | 5 000 | 10 000 | 100 |
| *M. melitensis* | | | | | | | | |
| Smith type | + | + | + | + | + | + | | — |
| Bruce Smith type | + | + | + | + | + | + | — | |
| *B. abortus* type | + | + | — | — | — | | — | |
| *B. coli* in 80 | + | + | + | + | + | | — | — |




Undulant Fever. Prolonged typical case.

[illegible] not seen [illegible] a difference [illegible] tests [illegible] that [illegible] his [illegible] from Texas and [illegible]

[illegible] generally were similar to those of cases seen ten [illegible] of a severe type pyrexia ran on for four months or more [illegible] was very protracted Malaria was an occasional com[illegible] in those cases that had served in the Eastern Medite[illegible] in the original diagnosis In fifty cases, with [illegible] fever was remittent in forty and hyperpyrexial in three [illegible] and mitis were recorded in thirteen bronchitis [illegible] marked tachycardia in three epistaxis in one and [illegible] in two In fourteen of these cases goats milk is stated [illegible] of infection and cows milk in one but the record [illegible] fully with regard to this point

[illegible] of Goats

In one case from the [illegible] an A B aged 24 the disease was [illegible] with [illegible] in one wave of pyrexia the temperature [illegible] 105° F [illegible] The [illegible] for eight months the man being treated in the hospital ships [illegible] and in the hospitals at Malta [illegible] and Greenwich [illegible] evidence of anæmia was very marked with [illegible] finally under an autogenous [illegible] but not [illegible] high—1/800

[illegible] death [illegible] at Malta in the person of a dockyard hand [illegible] between Bizerta, Malta

[illegible] Malta [illegible] the [illegible] usually entered as a case of influenza. The fever [illegible] twelve lasting four weeks the second also four weeks [illegible] with profuse sweating. Mental symptoms were marked a comatose state [illegible] long produced which lasted until his death. He denied the [illegible] blood infection but his blood gave an immediate positive agglutination with *M. melitensis* at a dilution of 1/200. At the post mortem the spleen liver and kidneys were all enlarged, and a gangrenous appendix with peritonitis was also found.

In other cases [illegible] the writer has found that the age incidence affects the mortality [illegible] the older the patient the worse the prognosis also there was a greater tendency to purpura and hæmorrhagic complications.

There was one definite case of a paramelitensis fever in a man who contracted the disease in the Adriatic. On admission to Greenwich he was almost convalescent but the blood when tested gave very clear agglutination reactions with 1 in 100 *M. melitensis* and 1 in 2000 with the *M. paramelitensis* (Nicolle).

From Malta Hospital two cases were reported by Surgeon Lieutenant Commander O'Flynn. Though the symptoms were typical of undulant fever no agglutination was obtained with the ordinary melitensis strains and therefore these cases were believed also to be probably a paramelitensis infection.

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## PART V.—(i) DENGUE OR SEVEN DAY FEVER

By Surgeon Rear-Admiral Sir Percy Bassett Smith, K.C.B., C.M.G., R.N. (Ret.)

In 1914 there were eight cases reported from Hong Kong and 108 from the East Indies mostly contracted at Bombay when the men were housed at the Sailors' Home the ships being in dock. In 1915 there were 313 cases eighty of which were treated in the Royal Naval Hospital, Bermuda the epidemic occurred in July and spread with great rapidity. The symptoms were fairly typical with well-marked pains in the eyeballs and back one case developed melancholia. Fifty were treated on board and eighty-six were from the East Indies. In 1916 the total cases reported fell to seventy and in 1917 to 122 most of which were from Bombay.

## (ii) PHLEBOTOMUS OR SAND FLY FEVER

By Surgeon Rear-Admiral Sir Percy Bassett Smith, K.C.B., C.M.G., R.N. (Ret.)

Several more or less extensive epidemics due to this cause were noted. These were mostly from the Eastern Mediterranean. H.M. Hospital Ship *Rewa* accounted for 259 cases in 1916 and 221 were treated at Madras Hospital in 1917.

[illegible] reports [illegible] T M Morris O B E [illegible] Lieutenant [illegible] MD DPH and Surgeon Commander [illegible]

## [illegible] PHLEBOTOMUS FLAVUS [illegible] THE EASTERN MEDITERRANEAN DURING THE [illegible] THE SPECIAL REFERENCE TO THE [illegible] MOUTHS

[illegible] T M MORRIS [illegible] RN

[illegible] small [illegible] considerable amount of sand [illegible] Mudros and was also met with in the [illegible] Samos [illegible] in the R N A S Camp at Thermi [illegible]

[illegible] in all these localities notably that [illegible] flat foreshore—in this [illegible] that peculiarly [illegible] and yellow-looking [illegible] East Mudros where the subsoil drainage is [illegible] becomes clogged with thick adhesive mud [illegible] crevices and fissures

[illegible] wood ash colour and very friable usually [illegible] sand which may be partially covered by [illegible] certain states of the wind Such soil is found in a typical form [illegible] Mudros and also seen at some parts of the Gallipoli peninsula [illegible] appears to be of the nature of a alluvial deposit

If therefore a camp is formed on this kind of soil, and the ground [illegible] becomes fouled and disturbed by the digging of drains, pits dug [illegible] soakage pits and latrines it in time becomes infected by sand-flies [illegible] phlebotomus fever occurs

It was noticed that camps situated on the unfavourable type of soil are usually immune for the first summer but suffer on the second year of occupation and with increasing severity each successive year when the soil has been disturbed and the various excavations completed

In other words the breeding places for the sand fly have been artificially constructed in a soil that suits their requirements This fact was noticeable in the naval camp and also in the R N A S Repair Base Camp at Mudros

The breeding haunts are in damp dark and airless crevices such as are to be found in dug-outs near the shore in the sides of soakage pits and drains in rubble and in old woodwork of piers and huts Any dark and damp crack in the soil may be a breeding place and hence the extreme difficulty in finding and dealing with the larval stage of the *Phlebotomus papatasii*

Artificial excavations are particularly frequented if made in this kind of soil near the sea level

The main prevention of sand-fly fever under war conditions, resolves

itself into the avoidance of such hostelries for camp use, and in seeking a clean soil, preferably on [illegible] high ground, and not [illegible] near the shore. This was put to the test in 1918 at the R.N.A.S. Camp at East Mudros when sand fly [illegible] particularly prevalent. The whole personnel was removed at [illegible] a camp composed of tents and situated three quarters of a mile from the infected camp. The [illegible] was on clean hard rising ground [illegible] the flat [illegible]. The camp remained perfectly free from fly [illegible] the [illegible] and would never be likely to [illegible] the [illegible] of the subsoil and good surface [illegible]. At Suda Bay the camp is situated in the old dockyard near the [illegible] and became infected in 1918. At Cherim, in Mitylene, the camp [illegible] and became infected on the second year [illegible]. The initial choice of the camp site decides the question [illegible] and dry [illegible] will [illegible] will be expected, but if the camp cannot be subsequently transferred to a more desirable site, there remain many steps which can be undertaken to lessen the amount and severity of infection. All huts should be well raised from the ground, thus allowing free ground ventilation and drying. The soil should be kept dry and exposed to sun and wind as far as possible. The ground underneath the huts should be levelled and sprayed with a mixture of crude oil and low grade paraffin at least once a week. All dark dirty spaces should be avoided under huts, and special care taken to prevent manure accumulating, as such spaces become ideal dark damp and moist breeding spaces. All rubbish should be cleared away from the vicinity, also the mild refuse, old store dumps and collections of canvas or condemned wood work as all these may afford suitable breeding places for the sand-flies. Efficient camp sanitation and inspection should deal with the surroundings of cookhouses, latrines and mess huts. Drains and soakage pits need constant supervision; these can be sprayed with C. fluid or strong cresol, or Lofin's pyrethrum solution (text) at times when sand flies are numerous. The burning and destruction of all refuse should be carried out daily. Huts may be sprayed with a 1 per cent solution of formalin, especially those used for the accommodation of the sick. Dug outs are frequently infested, and may be disinfected with sulphur, but this method needs frequent repetition and is often impracticable. Mosquito netting—even of a fine mesh—is useless in protecting against the fly. Special sand fly nets are so closely meshed that they prevent the circulation of air and add to the discomfort. Repellent preparations of various kinds were given an extensive trial, but with unsatisfactory results. A special ointment was made of the essential oils of turpentine, eucalyptus and aniseed. The most suitable of all was Price's Solid Anti Mosquito Preparation, being supplied in a convenient form and was the best for all practical purposes. Nothing effectually repels the attack of the female phlebotomus, which appears after sunset in large numbers with its distinctive, short moth-like flight. The adult insect is a minute hairy, buff coloured midge, being a voracious blood sucker, attacking chiefly the arms, wrists, hands and ankles.

[illegible] more than one hundred yards, and is [illegible] by the light [illegible] tents and huts They do not appear on windy evenings The larval and pupal stages of its development—being passed in damp and dark crevices—are difficult to demonstrate Phlebotomus fever first appears early in June and lasts until September The incubation period is short probably about three days The cause of the fever is considered to be a filterable virus transmitted after a period of six to eight days in the carrier host

The onset of the illness is sudden and produces a febrile stage lasting three days The characteristic symptoms and signs are severe frontal headache pains in the backs of the eyes and muscular pains in the legs and back The conjunctivæ are injected and there is pain on movement of the eye the pink eye is generally present No lachrymation Face flushed Temperature 102° to 103° F Pulse is comparatively slow—bradycardia is characteristic Tongue is coated in the centre and is not tremulous as in influenza The patient is invariably markedly depressed, and resents any noise He wishes to be left alone and is restless No enlargement of spleen or abdominal signs Urine usually normal There is leucopenia with moderate increase in the mononuclears Epistaxis occurs in some cases The patient may recover quickly, or the convalescence may be prolonged by anorexia, insomnia vertigo or depression Second attacks may occur

*Treatment*—The patient should be at once isolated, and placed in a quiet well ventilated hut or tent The hospital huts should always be placed well away from the main camp so as to avoid infection of carriers The first day of the fever is considered to be the infective stage The best routine treatment—and one which gave very satisfactory results—was to administer a full dose of opium at the onset of the fever and to continue the drug in doses of tinct opii min 20—8 [illegible] combined with small doses of mag sulph Other useful things are aspirin phenacetin and Dover's powder Quinine is useless in sand fly fever and only aggravates the symptoms It is a safe plan to place the patient under a sand fly net for the first day or so of his illness but the discomfort from lack of air is always complained of In many cases the hospital huts may be away from immediate infection by sand flies Rest in a quiet and airy hut is very essential in the treatment

Phlebotomus fever does not cause invaliding but may be the cause of considerable loss of service in the summer months, and so directly interfering with military efficiency

The lessons to be learnt from experience gained during the war in the Eastern Mediterranean area are that the greatest care should be taken in selecting and occupying sites for camps, in order to avoid the particular locality and the kind of soil that is likely to become infected when the many camp excavations have taken place

The immune areas are to be found situated on higher ground, away

[illegible] drainage [illegible] to move [illegible] then the best step is [illegible] site for the [illegible] in the [illegible] As many men as [illegible] infected [illegible] Thus, combined with [illegible] cases [illegible] of preventing the [illegible]

## [illegible]

By [illegible]

Phlebotomus fever is a clinical [illegible] three days fever [illegible] first in Malta [illegible] districts in India has only [illegible] of [illegible] interest [illegible] Doein in 1908 in Harzer [illegible] relationship [illegible] the [illegible] of phlebotomus flies and the [illegible] disease from the [illegible] collection of pyrexias of [illegible] Since that date a [illegible] amount of research with [illegible] in regard to the bionomics of the phlebotomus and the clinical and [illegible] logical aspects of the disease but even at present in view [illegible] analogy between this disease dengue fever and the "six" and [illegible] there still remains a fertile research for clinicians and [illegible] The existence of phlebotomus fever along the littoral of the Mediterranean (North eastern Eastern and Southern) and the correspondence [illegible] now definitely established and this paper deals with more especially the clinical aspects and in a lesser degree the epidemiological features of the disease as seen in an epidemic form in the island of Lemnos. It has certainly been present here for the last three years [illegible] 1917 the [illegible] that this fever was not very complete owing to confusion with many other prevalent conditions then very prevalent but accounts of the disease in equine form at that time on the Gallipoli Peninsula have been published by Armand-Delille [1] and Barraillé [2]. In 1916 a very definite epidemic was noticeable at Madras. In this paper an account is given of the epidemic of 1917 in so far as is possible in the circumstances under which it was carried. From May 1st to August 26 H.M.H.S. *Rewa* was stationed as a base hospital ship in Madras Harbour and for the greater part of this period received all patients both from the Fleet and the Naval and Marine establishments ashore. Naturally almost all the patients with phlebotomus fever were drawn from the shore stations. Up to the end of May 1st certain cases were treated either in H.M.S. *Europa* acting as the depot ship or in a temporary hospital ashore. After that date e.g. during June, July and August all cases were sent on board H.M.H.S. *Rewa* and it is on this group of cases that the notes in these pages are based.

## EPIDEMIOLOGY

The [illegible] in the spread of the [illegible] [illegible] [illegible]. The [illegible] transmitted through the [illegible] the phlebotomus [illegible] [illegible]. [illegible] [illegible] minute bites [illegible] present. [illegible] [illegible] [illegible] suffering [illegible] [illegible] present in the blood is infective [illegible] the [illegible] [illegible] [illegible]. After [illegible] period [illegible] [illegible] transmitting the virus—this [illegible] [illegible] the [illegible] concerning [illegible] [illegible].

The virus can be filtered through a Pasteur [illegible] filtrate [illegible] attack of the disease. [illegible] of the [illegible] or protozoal no definite [illegible] has been [illegible] [3] and Stocker [4] [illegible] similar [illegible] present in a small percentage [illegible] [illegible]. The origin and the nature of the infecting [illegible] therefore [illegible] from Doerr's observations it [illegible] that the [illegible] from season to season through [illegible] larvae [illegible] adult generation of the [illegible].

[illegible] established that [illegible] [illegible] transmit the disease. For a full [illegible] Manson and Craig's [2] book on Medical Entomology should [illegible]. [illegible] the disease is prevalent from May to September [illegible] during June, July and August [illegible] [illegible] the number of sandflies [illegible]. [illegible] the commonest sandfly present [illegible] was [illegible] [illegible] the species is yellow [illegible] in a [illegible] like the [illegible]. They [illegible] numerous [illegible] nights and may be caught in large numbers under [illegible]. They bite persistently [illegible] and [illegible] pass through the [illegible] mosquito curtain.

With [illegible] breeding places the vicinity of Mudros is ideal for them. [illegible] of stone roughly cemented [illegible] and loose [illegible] the [illegible] close to the [illegible] Marine camps is composed of [illegible] and in parts an [illegible] [illegible] the water's edge. [illegible] on the slope of a small hill [illegible] conformation [illegible] [illegible] stages of the [illegible] [illegible] situated [illegible] on the [illegible] headquarters and a French hospital [illegible] the N.T.O. camp [illegible] and the Marine camp along the [illegible] shore [illegible] [illegible] each other and lying between the water [illegible] and [illegible] Mudros village. [illegible] down the

[illegible] Naval camp is in [illegible] pools of stagnant [illegible] the neighbourhood [illegible] rubble [illegible]

Only [illegible] NAS camps provided [illegible] Naval camp had [illegible] number [illegible] under [illegible] developed [illegible] patients were received [illegible] miles away [illegible] Mudros. The population [illegible] of the troops [illegible] Naval camp [illegible] ships. The [illegible] draft to [illegible] considerable [illegible]

In the [illegible] this camp and [illegible] small fly [illegible] from a small [illegible] considerable [illegible] from Mudros [illegible] mic from [illegible]

The [illegible] the Marines was [illegible] the heavy [illegible] 110 [illegible] also [illegible] to small fly [illegible] ships but [illegible] days, and [illegible] ashore and [illegible] in one ship [illegible] Mudros [illegible] were occasionally [illegible] that the death [illegible] possible.

No information [illegible] population to the [illegible] prevalence or otherwise [illegible] village.

CLIMATE

Meteorological [illegible] was not kept on shore at the Mudros camp, but a relative comparison was obtained from the entries in the log of the *Rewa*.

During the summer [illegible] from May to August the weather is very settled occasionally [illegible] fresh breezes (No 4 to No 5 on the Beaufort scale) [illegible] from north to north-east for periods of three to four days [illegible] only calm or gentle breezes (No 0 to No 3) are present [illegible] when phlebotomus appears. Often there are intervals [illegible] when there is practically no breeze at night, and it is on these close sultry nights that sandflies are most numerous. As the incubation period of the disease is from three to four days, and the period of development of the virus in the fly is six to eight days, it might reasonably be anticipated that from eight to twelve days after a period of calm the admissions for sandfly fever would be greatest, and this is borne out by a relative comparison of the weather conditions with a table showing daily admissions. Thus the weekly admissions to the [illegible] for the weeks ending June 30 and July 7 reached a maximum of [illegible] and thirty four respectively, and, as will be seen from the following table, the weather during the corresponding central period for ten days [illegible] was very calm and settled.

TABLE I

| [illegible] | Direction of wind | Degree | Date | Number of admissions for sandfly fever |
|---|---|---|---|---|
| [illegible] | — | Calm 0 | June 27 | 6 |
| [illegible] | Variable | Light airs 1 | 28 | 8 |
| [illegible] | [illegible] | Calm 0 | 29 | 6 |
| [illegible] | Variable | Light airs 1 | 30 | 4 |
| [illegible] | [illegible] | Calm 0 | July 1 | 5 |
| [illegible] | Variable | Light airs 1 | 2 | 1 |
| [illegible] | — | Calm 0 | 3 | 4 |
| [illegible] | Variable | Light airs 1 | 4 | 4 |

TABLE II

| [illegible] | [illegible] | Degree | Date | Number of admissions for sandfly fever |
|---|---|---|---|---|
| [illegible] | [illegible] | Moderate breeze 4 | July 11 | 3 |
| [illegible] | [illegible] | Gentle breeze 3 | 17 | 1 |
| [illegible] | [illegible] | Moderate breeze 4 | 18 | 2 |

[illegible] the [illegible] seasonal number of admissions with [illegible] but in the evenings of the previous ten days. The [illegible] June and July were 28 per diem. Examination [illegible] shows that about forty six days (June 1 to August [illegible]) [illegible] night [illegible] provided on forty one light or gentle breezes while [illegible] there a moderate or fresh breeze (No 4 to No 5 Beaufort). The [illegible] are for the evening at 8 p.m.

[illegible] *daily temperature* [illegible] noon and [illegible] generally at 4 p.m.) for the [illegible] Table III.

TABLE III

| | Average daily noon temperature | [illegible] |
|---|---|---|
| [illegible] | 79.3° F. | [illegible] |
| [illegible] | 81.8° F. | [illegible] |
| [illegible] | 82.7° F. | [illegible] |

The [illegible] were taken by means of a thermometer [illegible] the [illegible] hence they do not give real [illegible] Table [illegible] There is practically no difference [illegible] months.

GENERAL REMARKS

About [illegible] cases of phlebotomus fever were [illegible] during the month stay at Mudros. Excluding the [illegible] and other [illegible] were simultaneously present with the [illegible] in which [illegible] examination revealed no [illegible] diagnosis [illegible] of 107 cases was eventually [illegible] purposes.

The *age distribution* was as follows —

TABLE IV

| Age | Number of cases | [illegible] |
|---|---|---|
| 20 and under | 101 | [illegible] |
| 30 | 5 | [illegible] |
| 40 | 31 | [illegible] |
| 50 | 17 | [illegible] |
| | [illegible] | [illegible] |
| Total | [illegible] | [illegible] |

The *weekly* [illegible] from 31st August 20th [illegible]

TABLE V

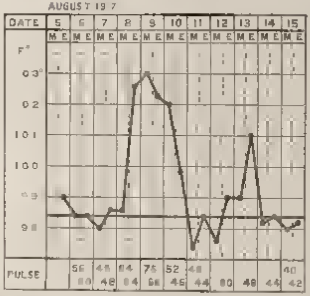
| | | |
|---|---|---|
| Week ending [illegible] | [illegible] | [illegible] |
| [illegible] | 14 | [illegible] |
| [illegible] | 13 | [illegible] |
| [illegible] | 20 | [illegible] |
| [illegible] | 7 | [illegible] |
| [illegible] | 11 | [illegible] |
| [illegible] | 1 | [illegible] |
| [illegible] | 5 | [illegible] |
| [illegible] August | 1 | [illegible] |
| [illegible] | 11 | [illegible] |
| [illegible] | 15 | [illegible] |
| [illegible] | 3 | [illegible] |
| | Total | [illegible] |

CLINICAL COURSE

The [illegible] 7 is stated by But [illegible] in 3 days and [illegible] two to four days.

In [illegible] of cases as it was [illegible] and it happened to be [illegible] under [illegible]

[illegible] shown on August 15 [illegible] symptoms on the fifth [illegible] typical symptoms [illegible] No. 2 [illegible] only fifteen on August 18 [illegible] was August 21. On [illegible] relapsed in Cottonwood [illegible] R.N. [illegible] August 14 at the




[illegible] gastrointestinal [illegible] Black [illegible] indescence [illegible] Head [illegible]

[illegible] he was bitten severely by sand flies [illegible] on August 5 he [illegible] with marked edema of the [illegible] of the [illegible] secondary to the bites. He then had a temperature [illegible] for a week. This subsided on the fifth swing day and the [illegible] but on August 8 in the evening he developed [illegible] the typical face congestion with a rise of temperature [illegible] was present with a temperature of 104° F. on [illegible] practically under observation from twelve hours after [illegible] definitely he has had at three days. A [illegible] Chart B is given is of special interest as, [illegible] prior being shown it is very typical in regard to temperature [illegible] and it also shows a very definite

[illegible] in the fifth and sixth days [illegible] [illegible]

*Prodromal symptoms* apart from slight malaise and very [illegible] [illegible] dull [illegible] headache are rare.

*Onset.*—If the disease is remarkably abrupt in many cases there is a marked resemblance to the dramatic suddenness with which some malarial attacks. The patient generally volunteers the statement that in a few hours the first symptoms were noticed. In a considerable number of cases the patient awakes up in the morning with the acute symptoms already present. A chilly rigor is rare. If it was present in any case it was present series. More usually there is a feeling of chilliness only, or alternate flushings and cold sensations are felt. Slight dizziness or vertigo is often present. Supra-orbital headache rapidly supervenes, and in a few hours the pain is frequently referred to the back of the orbit. This pain is increased in any movement, especially of the eyes, and vertigo is present if the eyes be moved rapidly. The eyeballs become sensitive to slight pressure. Photophobia is rarely present. The patient dislikes a bright light. Muscular tone is rapidly lost, and the limbs, especially the legs, feel very weak, in several cases this "gives way." In the legs, weakness is the initial reason for the patient reporting himself. Asthenia is rapidly followed by pain, referred generally to the muscles, especially of the thighs and calves, particularly the deltoid and biceps muscles. In many instances the joints are said to be painful, but examination never determines the seat of the pain in the tendinous attachments of the muscles near the joints. Synovitis is never present. Stiffness and pain in the back of the neck may be considered pain in the lumbar region of the spine is almost always present. Some muscular tenderness is present, but [illegible] and tenderness of lumbar nerves is often [illegible] by [illegible] of the lumbar spine. By some patients the pain is said to be in the bones of the limbs. It is very severe in many cases and might well justify a diagnosis of dengue (or bone-fever).

Moreover, pain is referred to the epigastrium (in 10 per cent. of cases). In some, but not all of these cases, the pain is [illegible] in a few instances, shifting to a [illegible] pain.

Vomiting either at the onset or later was met with in 5 per cent. of this series of cases. Epistaxis was noticed in 6 per cent. Slight sore throat at the onset was noticed in 10 per cent.

The facial [illegible] is rapidly [illegible] and [illegible] pallor is very marked. The patient [illegible] [illegible] presented in a distinct [illegible] other symptoms apart from [illegible] are rarely present. In a few cases there is slight [illegible] [illegible] temperature rises rapidly to 103° F. in a few [illegible] to 104° or 105° F. The highest temperature in this series was 106° F. on the day following the onset. Pulse rate rises [illegible] but not in proportion to the temperature rise. In the [illegible] restricted to the [illegible] pulse rate of 112 with a temperature of 106° F., in another patient a rate of 130 with a temperature of 105° F.

[illegible] the name of [illegible] inflammation of [illegible]

[illegible] the tongue [illegible] the mucous [illegible] full of [illegible] [illegible] ingestion the soft [illegible] line of [illegible] per cent of [illegible] the soft palate [illegible] small hyperemia [illegible] the [illegible]

[illegible] consisting of the [illegible]

[illegible] the neck were not appreciably enlarged or tender in any case.

The bowels as a rule are constipated in two cases the onset of the disease was accompanied by temporary diarrhœa not of a dysenteric type. Anorexia and loss of appetite are very usual. Rashes apart from simple erythema of the skin or star abdomen and miliaria (sweat rash) were not seen in any case. Only was there any dengue-like rash—although was well marked in the case it was present on the third day and was unaccompanied by any rise of temperature or recurrent pains and was probably due to [illegible]. Sweating is usual after the first twelve hours.

Nasal or laryngeal catarrh was present in five cases and a slight [illegible] catarrh in two. Tonsillitis developed during the first [illegible] slight attack of pleurisy very localized and rapidly [illegible] temperature rise while one patient developed bronchopneumonia [illegible] temperature [illegible] two days.

A certain [illegible] occurred in one patient, with a rise of temperature to 100.8° F. on the fourth day of the illness but all symptoms had disappeared on the seventh day. Dysentery developed in some few cases

[illegible]

In 6 per cent. [illegible] enlarged to percussion [illegible] the spleen became [illegible] with the fall [illegible] changes were found.

Blood counts showed the usual leucopenia [illegible] nuclear element [illegible] following is a chart [illegible]

Case No. 101 (July 3)

| Day of disease | White [illegible] per c.c. | Lymphocytes [illegible] |
|---|---|---|
| 1 | 5,300 | [illegible] |
| 2 (T. normal) | 4,100 | [illegible] |
| 4 | 4,080 | [illegible] |
| 6 | 6,000 | [illegible] |

(*Illegible*)

## Clinical and Practical Notes.

### A METHOD OF MAKING A BLOOD FILM AND AN [illegible] RESULT

By Surgeon Commander FREDERICK COCKLEN

It is well known that in a blood film made in the usual manner [illegible] the end of a slide as a spreader there is an excess of nucleated [illegible] sides of the film.

Whilst making various attempts to obtain an even distribution of cells the following method revealed this arrangement the edge of the film being occupied almost entirely of red blood cells and the central part of the film showing numerous white cells and very few red cells in proportion.

The method is simple, and consists of slowly passing a drop of blood over a glass slide.

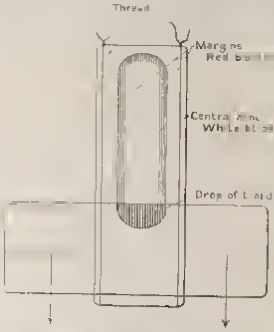
Two pieces of thick thread are placed on the edges of a glass slide (see illustration).

A drop of blood is placed at one end and a second slide placed on top of it. The blood must not spread out to the extent of reaching the threads. On slowly moving the uppermost slide over the first the drop forms a film which is semicircular in shape and a thin film is left on the surface of the slide, with margins and a more or less clear central zone.

After staining (Jenner) both after both of the various [illegible] platelets (mostly the basophile elements) are found in the central zone and the margins consist mostly of red blood cells (complete [illegible]).

In the few cases in which I have used the central zone [illegible]

the results [illegible] as correct as [illegible] but [illegible] the ordinary [illegible] the little cells [illegible] male




[illegible] blood trematode parasites would be [illegible] found [illegible] opportunities [illegible] Surgeon Commander G. D. Wi[illegible] R.N. who [illegible] of making films may be [illegible] and possibly [illegible] routine blood examinations.

## Reviews.

[illegible] Disease [illegible] M.B. [illegible] M.D. [illegible] Thirteenth. Royal [illegible] Edinburgh and London: E. & S. Livingstone, Ltd. 1923. [illegible]

[illegible] is the fifth edition [illegible] small [illegible] Heart Suite Diet Consist [illegible] Diet [illegible] review the author has [illegible] the [illegible] It contains [illegible] to the account of the [illegible] the [illegible] to the chemist [illegible] to examine [illegible] It is [illegible] time to make a special study of the [illegible] most useful and they will certainly not be [illegible]

[illegible] M.R.C. [illegible] London [illegible] + 576 [illegible] figures [illegible]

[illegible] is one of the books supplied [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] from [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

The [illegible] the [illegible] It [illegible] confu[illegible] a good [illegible] especially [illegible] it is specially [illegible]

[illegible] MAOx[illegible] [illegible] 30[illegible]

[illegible] Hawkins [illegible] of the [illegible]

[illegible] HANDBOOK [illegible] Dombleby [illegible] Club [illegible] St [illegible] and [illegible] Mbone St [illegible] St George's Hospital. With [illegible] W. Henson [illegible]

[illegible] handbook [illegible] for higher [illegible] is intended [illegible] so that [illegible] the book [illegible] biology and [illegible] these [illegible] sees [illegible] book [illegible] things.

[illegible] with [illegible] of [illegible] with [illegible] and [illegible] methods and [illegible] an appendix [illegible] important words and their [illegible]

[illegible] of its general [illegible] and a detailed [illegible]

[illegible] up the subject [illegible] of slides of the [illegible] collection the [illegible]

[illegible] M.A., M.D. [illegible] Director [illegible] Hampton [illegible] Colonial [illegible] Lectures not [illegible]

The book is an excellent [illegible] labour in [illegible] tools, and commends itself to students as being [illegible] useful and reliable. In regard to the urinary [illegible] tests, [illegible] well is a fortunate [illegible] that [illegible] space has not been allotted to the [illegible] and estimation of the sugar content of blood and urine. Hence [illegible] tests for blood [illegible] are carefully tabulated and [illegible] preparation and standardization carefully [illegible]. The [illegible] in the differentiation of *B. typhosus* and the various [illegible] are all easy of [illegible]

[illegible]

Hygiene and Sanitary Laws for the [illegible] Practitioners. By B. [illegible] M.D., [illegible] Ninth Edition. Edited by H. B. Kenwood, C.M.G., M.B., [illegible] D.P.H., Chairman Professor of Hygiene and Public Health [illegible] Medical College. 1923. Pp. xxvii + [illegible]

This valuable book was reviewed [illegible] last edition in 1911. It has now been again revised and brought [illegible] as possible by Professor Kenwood.

Public health laws perhaps [illegible] so constantly altering, or being repealed and others added that [illegible] ultimate book of this kind to make it absolutely complete. [illegible] with some few exceptions has succeeded in his task. The [illegible] confined to all candidates who are working for the [illegible] health.

Concise Medical History. A Little Book of [illegible] History of Medicine. By S. D. [illegible] M.B., [illegible] Consulting Surgeon to St. [illegible] and C. S. Thompson, M.B.E., Associate of the [illegible] Museum, Curator of the Wellcome Historical Medical Museum. [illegible] John Bale, Sons and Danielsson, Ltd. [illegible] 10s. 6d. net.

This small book will form a useful [illegible] the history of medicine. [illegible] periods and events in the history of the [illegible] Although it gives interesting facts [illegible] the book is not [illegible] sense a history of medicine. [illegible] small marginal portraits.

It is to be regretted that the [illegible] to date and in the foreword they use the [illegible] the present [illegible] account of any famous man born in the 18th and the chronicle of important discoveries stops at 1905. The same [illegible] applies to the [illegible] of drugs

[illegible]

[illegible]

[illegible]

[illegible] Its [illegible] A Manual [illegible]

Price [illegible]

The [illegible] be practised [illegible] this good or [illegible] to one [illegible] practice [illegible] will fall to [illegible] exist [illegible] will [illegible] On the other [illegible] women at [illegible] being [illegible] clothed [illegible] public asylums [illegible] the offspring of [illegible] and body [illegible]

The Government [illegible] tion. [illegible] appears [illegible] legal [illegible] the dissemination [illegible] harmless [illegible] sooner [illegible]

There [illegible] and the [illegible] medical [illegible]

Dr. Mary [illegible] and at the [illegible] the health [illegible] —especially [illegible] the [illegible] advocate [illegible] Ship [illegible] the [illegible] her [illegible] relative on the [illegible]

She [illegible] the more [illegible] contention [illegible] Doctor [illegible] sleeps [illegible] although [illegible] about [illegible] other [illegible] and [illegible]

The [illegible] important [illegible] position in the [illegible]

Manual [illegible] Navigation [illegible]

By Simeon [illegible] M.D. [illegible]

Published [illegible] with [illegible]

Illustrated [illegible]

The appearance [illegible] general [illegible] the book has [illegible] which will [illegible] usefulness [illegible]

The section [illegible] of the male organs of generation that has appeared [illegible] this will be of material help in explaining [illegible] treatment of gonorrhœa

[illegible] poisons [illegible] included to the [illegible] treatment of burns and [illegible] description of [illegible]

[illegible] mals, the mechanism of snake bite has [illegible] of the chief characteristics of the two [illegible] (cobras and vipers) and of the effect [illegible]

[illegible] to by short accounts of cerebrospinal [illegible] the relationship between lice and typhus [illegible] however of the importance of destroying [illegible] any reference be found to the new method [illegible] formalated lime instead of formalin and [illegible] crosses described, no differentiation between [illegible]

[illegible] preparation for naval action are full of [illegible] dispensing, has been added and perusal [illegible] have dispensing to do afloat A [illegible] for Service Afloat is given with [illegible] quantities of dispensing and chief uses [illegible] in heavy type [illegible] for which it is written and the [illegible] volume of such convenient size so [illegible] valuable information on all subjects [illegible]

[illegible] the previous one and the price [illegible] is somewhat increased [illegible] error on p 281 where Thomas's [illegible]

[illegible] By E Poulsson Professor of [illegible] English edition edited by W [illegible] M D [illegible] William Heinemann, 20 Bedford [illegible] London W C [illegible] net

[illegible] pharmacologists [illegible] should be very welcome as [illegible] of [illegible]

[illegible] those who like to view such [illegible] as a means of obtaining a general [illegible] generally agree with those [illegible] also very useful book to the British [illegible]

[illegible] article on therapeutic uses of [illegible] with [illegible] published in English [illegible] given in the same doses [illegible] the alkaloid in the commonly [illegible] the hallucination than the word [illegible]

[illegible] that poisonous doses [illegible] as special cases of fatal [illegible] in this country [illegible] found recently to obtain

complete solution of the cresole appears to [illegible] the point [illegible] ls one have a [illegible] higher bactericidal co efficient than [illegible] solutions of [illegible] the strength in cresol

See on p 230, although it is implied it would be better to [illegible] the it clear that it is in the living tissue that cresote is not able to kill the tubercle bacilli in the lung or elsewhere

The classification is that of Schmiedeberg

(1) Organic remedies acting after absorption
(2) Organic remedies acting locally
(3) Salts of light metals, alkalies acids, halogens oxidizing media, &c
(4) Heavy metals
(5) Ferments and foodstuffs
(6) Antitoxins and bacterial products

This classification appears to be the most satisfactory at present devised

F W H

## Preparations, &c.

### NEOPLASTIC REACTION OUTFIT

(London The Anglo French Drug Co Ltd 238a Grey s Inn Road W C 1)

We have had submitted to us the details of this small outfit which enables the medical officer or general practitioner who is not equipped with a biological laboratory to carry out the serological reactions described by M M Binetti at the conference of the Société de Biologie on January 7, 1923

Neoplastic Reaction Outfit

Briefly it depends on the variations in the reductive power of normal and cancerous serums on methylene blue in the presence of extracts of cancerous tumours

The speed of reduction appears to be very much higher with cancerous serums than with normal and is well worth further investigation as the advantage of being able to distinguish a benign from a cancerous tumour without histological examination must be very obvious

# News of the Service.

## BIRTH.

[illegible] 1923 at 74 Fosting Grove Southsea [illegible] Surgeon [illegible] R.N. a daughter.

## OBITUARY

[illegible] the death of Surgeon Colonel Alex. Bedingfield [illegible] September 1923 aged 46.

[illegible] Service. The record [illegible] connection, generations united them [illegible] with the Navy [illegible] normally on [illegible] the Medical Department [illegible] and received [illegible] qualifications [illegible]

[illegible] there he remained [illegible] service and [illegible] he was elected [illegible] board. He *Indian F.* and served long with con[illegible] Medical Officer to the Imperial Hospital at Strathpeffer. The [illegible] back up as the object of that hospital's career. After [illegible] Conseil du Salut Russian Refugees [illegible] he developed double pneumonia and was [illegible] From the after results of the pneumonia [illegible] he took up the study of Ear, Throat and Nose [illegible] double that in the work he had [illegible] specialist. He last, when he died and apart from [illegible] particular direct interest to small [illegible] had of infinite capacity for attention to the [illegible] his hobby.

Per[illegible] Surgeon Rear-Admiral George A. Drespar, C.B., Principal Medical Officer, Royal Navy, Surgeon to His Majesty.

## AWARD OF SIR GILBERT BLANE'S GOLD MEDAL

The award of the Gilbert Blane Medal for the year 1923 has been made to Surgeon Lieutenant-Commander J. T. Parkes, who obtained a first-class certificate at the examinations held in connection with the promotion course 1923. He obtained the highest number of marks in both the examinations held in connection with the promotion courses 1922-23 and 1923-24.

## DEGREES AND DIPLOMAS

Surgeon Lieutenant-Colonel H. W. Fitzroy Wellington, M.B., was successful in passing the examination for the Diploma in Public Health, Queen's University, Belfast.

## EXAMINATION FOR PROMOTION

[illegible] medical officers in alphabetical order who were established to pass the qualifying examination for promotion to Surgeon Commander at the end of the [illegible] months course held in March 1923

Surgeon Commander to Commander R B Crawford
W I Cormack M B D T H
E S Mettam M B
H H Parker D S C M B D T M
C L Robb M C M B
J C Simpson M B
H Wilks

Surgeon Commander H B Parker has also been given a position [illegible] qualified for promotion to Commander [illegible]

## PROMOTIONS

Surgeon Captain Arthur Gerald C B D S O F R C S I P H promoted to Surgeon Rear Admiral dated 7th July 1923

Surgeon Commander William Ignatius Marion O B E F R C S I L A [illegible] promoted to Surgeon Captain dated 30th June 1923

Surgeon Lieutenant Henry Alexander Leonard Guthrie promoted to Surgeon Commander dated 29th July 1923

Surgeon Lieutenant Thomas Alnutt M B promoted to Surgeon Lieutenant [illegible] dated 28th August 1923

## NAVAL MEDICAL COMPASSIONATE FUND

At the Quarterly Meeting of the Directors of the Fund held on July 1921 [illegible] £[illegible] was allotted and £45 voted to the applicants. The following is a summary of the cases [illegible]

Widow aged 39 of a surgeon commander in Royal Navy who died in 1921 [illegible] pension and a small private income and has two small children entirely dependent on her whose education has to be provided for. Voted £25

Daughter aged 41 of a Deputy Inspector General in Royal Navy who died in 1909 [illegible] dependent on her mother who is in receipt of a widow's pension and a grant from the Naval Medical Compassionate Fund. Voted £20

**Medical Officers on the Active List of the Royal Navy who have not yet subscribed to the Fund are invited to do so at an annual subscription of one guinea. Subscriptions should be sent to the Honorary Secretary Naval Medical Compassionate Fund Medical Department of the Navy Admiralty S W 1**

## ADMIRALTY ORDERS ISSUED FROM JUNE 15, 1923, TO SEPTEMBER 15 1923

(Only the more important Orders pertaining directly to the duties of the Medical Officer affect, and not confidential are included )

### 2650 — Weekly Health Report

(N [illegible] III 23 — 2 [illegible] 1923 )

The Senior Medical Officer of each ship attached to a Fleet or Squadron is to forward every Monday morning to the Principal Medical Officer of the squadron a report on the general health of Officers and men in form S 189 as follows —

*Form S 189*

WEEKLY HEALTH REPORT

I—TABLE—For week ending Saturday

| (1) | (2) | (3) | (4) | (5) | | |
|---|---|---|---|---|---|---|
| Name of Ship | Average Daily No Victualled | Total Days Sickness | Average No Sick Daily | Percentage Sick Daily | No of Cases sent to Hospital | |
| | | | | | Infectious | Non infectious | Venereal |
| | | | | | | | |

[illegible] of days [illegible]

[illegible] applying, [illegible] dividing [illegible]

[illegible] in hospital [illegible] those calculated

[illegible] the week of all up [illegible]

[illegible] fever entering up [illegible]

[illegible] the week of venereal [illegible]

[illegible] the week from venereal [illegible]

[illegible] (Sickness [illegible]

[illegible] issued during the week

[illegible] possible

[illegible] used by the [illegible]

[illegible] was made by the [illegible]

[illegible] filled

[illegible] and numbers inflected

[illegible]

[illegible] Flotilla or Squadron will for year [illegible] to [illegible]

Department [illegible] Squadron Summary on Form S [illegible]

S 150a

WEEKLY REPORT—SQUADRON SUMMARY

[illegible] Squadron

Week ending [illegible]

| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

[illegible] Director General

[illegible]

Forwarded

Surgeon Commander

Fleet or Squadron Medical Officer

Approved

Admiral

Commander-in-Chief or

Flag Officer Commanding

[illegible] Depot Naval [illegible] Victoria [illegible]

(4) The [illegible] form of which a fitted supply [illegible] demand [illegible] R.N. Stores Depot Royal Victoria Yard [illegible] follows:

[illegible] Medical Officer [illegible] with a Medical Officer [illegible]

[illegible]

(5) A.F.O. [illegible] cancelled as from the date of receipt [illegible] above forms.

(A.F.O. 211/19.)

**2382.—Manual of Instruction for the R.N. Sick Berth Staff—Revision.**

(Sta. 30/6/21—21/8/1923.)

The Manual of Instruction for the R.N. Sick Berth Staff has been revised and [illegible] dition is available. Copies of the revised edition of the book for annual and sale up to [illegible] will be issued on demands addressed to the H.M. Stationery Office. Well-bound backs [illegible]

The price of the manual is not shown in the book, as it is a special and all special [illegible] brought [illegible] the sale of H.M. Stationery Office.

It is intended that [illegible] new entrants for the R.N. Sick Berth Staff are to be supplied with copies [illegible] the existing edition [illegible] replace the edition at present [illegible] shall be on a copy as above.

**2384.—Ventilation in H.M. Ships.**

(S. 2/5/23—7/8/1923.)

The following notes on ventilation in H.M. Ships are promulgated for [illegible] information:—

GENERAL.

The ventilation of H.M. Ships is provided as follows:—

(a) Naturally, by means of hatchways, doors, sidelights, [illegible]

(b) Artificially, by means of fans, or

(c) By both methods combined.

Artificial ventilation can be effected in three ways:

(1) By a forced supply of fresh air, the foul air being allowed to escape through trunks, doors, hatches, scuttles, &c. This system is adopted in large and [illegible] spaces where a good supply of fresh air is essential.

(2) By a forced and natural foul air, the fresh air taking its place being allowed to enter where it may. A typical case is W.C.s, bathrooms, galleys, [illegible] removal of foul air is essential.

(3) By a combined system employing both forced [illegible] mainly in engine rooms.

FANS.

A man requires 3,000 cub. ft. of fresh air per hour, and the fan [illegible] ship's designed to supply that amount. The approximate output of the [illegible] fitted in the Service when running at full speed are as tabulated below. [illegible] given being those obtained under [illegible]

| | | | | |
|---|---|---|---|---|
| Nominal size of fan (in.) | 16 | 12½ | 7½ | 5 |
| Discharge pressure in inches water gauge | ½ | ¾ | 1 | 1 |
| Output in cubic feet per minute | 4,000 | 2,000 | 900 | 500 |

LOSSES IN TRUNKING.

The fan outputs are liable to be seriously reduced by unsuitable trunking and [illegible] quantity due to any of the causes enumerated below:

(1) *High velocity of air.*—This is very important as the losses due to air [illegible] the square of the velocity. In practice it is found that the velocity should not exceed 1,500 ft. per [illegible] average trunking, or about 1,600 with bends, tees and branching.

A large fan thus requires a large trunk in order to limit the velocity of the air [illegible] table amount.

(2) *Bends and Changes of Section.*—The inner radius of a bend should [illegible] the width of the trunk or its loss will be great. The section of the trunk should [illegible] possible be of the circular or nearly square and should not change abruptly.

(3) *Internal Surface Roughness.*—The [illegible] trunking [illegible] increased resistance. The joints should be kept plain and free from projections.

(4) *Length.*—Loss due to friction increases directly as the length of trunking and in proportion is found that the number of bends (and thus the loss) also increases.

A very long and restricted trunk—without [illegible] delivery—will almost completely throttle a fan.

[illegible]

[illegible] the various [illegible] of a [illegible] wash [illegible] It is not in one decanter [illegible] be effected [illegible] It is important that [illegible] fitted in [illegible] vessel [illegible]

[illegible] the first [illegible] the [illegible] liquidity [illegible] insured [illegible] and [illegible] to keep [illegible] in [illegible] maintain [illegible]

[illegible] difficult one and is being fully [illegible]

---

**2433.—Dangerous Drugs Act, 1920.**

(N.L. 11874/23.—14.9.1923.)

[illegible] issued in order to observe as far as possible [illegible] H.M. Ships and [illegible] are laid down by the Regulations of the Dangerous Drugs [illegible] the physician and Administration of Morphine Cocaine [illegible] Dangerous Drugs [illegible] separate salts raw and medicinal opium and preparations and [illegible] that one fifth part of Morphine or one sixth part of Cocaine [illegible] (the Morphine to be calculated as anhydrous Morphine).

SECTION A.

Naval [illegible] meets at home [illegible] including Hospitals Sick Quarters R.M. Infirmaries Depots [illegible] R.N. Barracks at Portsmouth Chatham and Devonport and Hospital Ships [illegible] Establishments where no Pharmacist is employed [illegible] the [illegible] Officer. The usual records are to be kept in accounts M.7 and M.8 of all [illegible]

[illegible] preparations required to be kept in a ward or special department and the supply at [illegible] M.10 are to be returned in a locked cupboard the key of which is to be kept [illegible] Medical Officer in Sick Bay [illegible] the ward [illegible] in accordance with the directions of a Medical Officer [illegible] these drugs supplied for individual patients or prescriptions written [illegible] M.40 (L.S.) are to be kept in a locked cupboard in the ward, in a [illegible]

[illegible] Inspector will only be replenished at the Dispensary by a requisition [illegible] on the special forms M.23 signed by a Medical Officer which requisition is to be [illegible] the name of what the issue is made.

[illegible] supplies furnished to wards or departments are to be made by the [illegible] M.8" separate lines or sections and a form being used for each class of drug [illegible] to retain and file the duplicate copies of the requisitions [illegible] M.23 [illegible] kept with the Dispensary.

[illegible]

10 [illegible]

11 [illegible]

12 [illegible]

13 [illegible]

14 [illegible]

15 All Pa[illegible] one of the [illegible]

16. It must [illegible] of the [illegible] writing a [illegible] under the [illegible]

[illegible]

1 All supp[illegible] salts and of [illegible] than one [illegible] (the blue plate [illegible] taken in charge by the [illegible] the usual [illegible]

2 The Ma[illegible] are the sale or to [illegible]

3 A record [illegible] drugs and then [illegible]

| Date of Issue | Name of [illegible] | Rank or [illegible] |
|---|---|---|
| [illegible] | [illegible] | [illegible] |

4 The record [illegible] into four sections [illegible]

[illegible] pieces containing the [illegible]

[illegible]

[illegible] Form M [illegible] and is [illegible] company that [illegible] not being a [illegible] manuscript form [illegible] be

[illegible] Officer or [illegible] solution administering [illegible] purpose but a record of such administration

[illegible] to the fact that these drugs are supplied [illegible] disciplinary measures will follow if it [illegible] of anyone attempting to obtain

[illegible] (1 9) apply to the following drugs and

[illegible] Morphine B P (1898) containing 0 75 per cent

[illegible] anhydrous Morphine

[illegible] containing 0 975 per cent anhydrous

[illegible] anhydrous Morphine

[illegible] anhydrous Morphine

[illegible] anhydrous Morphine

[illegible] of Ice

[illegible] of Adrenalin

[illegible] Ether

[illegible] Acetic Salicylic

[illegible] Ether

[illegible] *not affected* by the provisions of the Dangerous

[illegible]

[illegible] Torpedo Boats Torpedo Boat Destroyers [illegible]

10 [illegible] and Mercantile Ships attached to the Navy temporarily [illegible] Commander of the Ship shall be deemed to be [illegible] drugs so long as it is necessary to comply with the [illegible] Merchant Shipping Acts and it shall be [illegible] the Secretary of State to administer and apply the [illegible] in accordance with instructions prepared and sanctioned [illegible] by the [illegible] Navy under or in the Merchant Service by the Board of [illegible]

The [illegible] of the special [illegible] drugs in Ship's Log shall be deemed to be in compliance [illegible] as to the keeping of records

11 For M [illegible] Commanding [illegible] of the receipt and issue of these drugs shall be passed [illegible] the date of the prescription or of the last entry in the [illegible] may be [illegible]

12 It is [illegible] Naval Medical and Dental Officers that in the event of their writing prescriptions [illegible] Chemists on shore the regulations made under the Dangerous Drugs Act apply in full

---

Note —A [illegible] M (C A M 236 M 237 and M 238 will be made to all concerned without demand [illegible] from the R N Store Depôt, Royal Victoria Road Deptford S E 8

# INDEX

# Notices

[illegible] Medical Officers to [illegible] Papers on [illegible] personal experience [illegible] of new [illegible] Naval Medical [illegible] welcomed [illegible]

[illegible] published [illegible] of the Royal Medical Service will [illegible] the author [illegible] the copyright [illegible]

[illegible] Death [illegible] charge [illegible]

**All Communications should reach the Editors on or before the 1st of the month preceding the date of issue.** Unless clearly written they should be typed in order to avoid mistakes, and they should be addressed to the Editors, JOURNAL OF THE ROYAL NAVAL MEDICAL SERVICE, Medical Department, Admiralty, London.

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